TECHNOLOGY DEPT.

the OIL AND GAS JOURNAL

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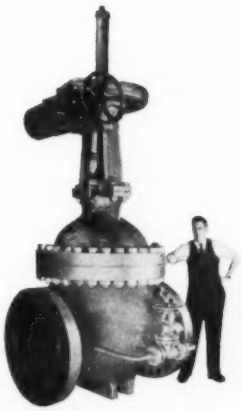
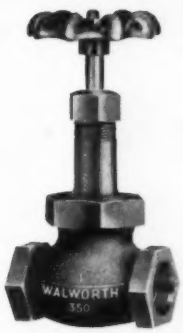
DETROIT

Walworth Valves for the Petroleum Industry

Iron Body Gate Valves


Cast Steel Pipe Line Valves

Lubricated Plug Valves



Bronze Valves

Stainless Steel Valves

Walworth manufactures a *complete line* of Gate, Globe, Angle, Check, and Lubricated Plug Valves, made of stainless steel, steel, iron, bronze, and special alloys in a wide range of sizes and temperature-pressure ratings.

Fittings of steel, iron, and bronze are also manufactured in all conventional types and sizes.

WALWORTH
valves and fittings
60 EAST 42nd STREET, NEW YORK 17, N. Y.

STRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

PRICE 50 CENTS TABLE OF CONTENTS PAGE 35 **NOVEMBER 23, 1950**

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for free?

Where's the Gimmick?

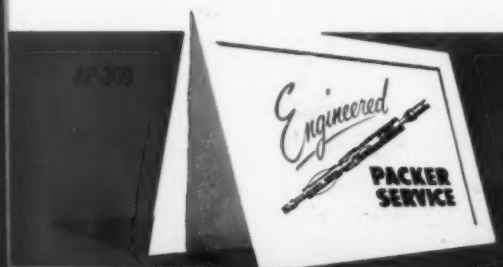
There is NO catch—
don't waste time looking for it!

You can't blame a man for looking a gift automobile under the hood, but it's a waste of time when there is no hidden snapper—as in this case. Let us emphasize that Engineered Packer Service is available to any operator, simply on request, regardless of the equipment used, entirely without cost or obligation

But "no cost" is practically an afterthought with the many operators who are using Engineered Packer Service because it gives them the things they need to know—correct, factual working information which applies directly to the job The Lane-Wells field men, (all 101 of them) who supply these engineered programs are thoroughly trained and experienced in the seven major areas of packer work—

1. Determining Applicability of Packer to Specific Conditions 2. Uses of Packers and Packer Set-Ups. 3. Correct Packer Selection. 4. Packer Setting Programs. 5. Procedures in Pulling Packers. 6. Packer Operation and Efficiency 7 Packer Maintenance and Repair.

Ten chances to one, you'll profit from Engineered Packer Service, even if it is free. Convince yourself the easy way—call your Lane-Wells packer expert.



Los Angeles • Houston • Oklahoma City

LANE TECHNICAL OIL FIELD SERVICES WELLS

General Offices, Export Offices and Plant 5610 So. Soto St., Los Angeles 58, California

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✓ CHECK THE QUALITY
✓ CHECK THE PERFORMANCE

The next time you consider pipe for distribution lines, be sure to check the quality and the performance record of Bethlehem Oil and Gas Pipe.

Bethlehem Oil and Gas Pipe provides long, economical service in any location, in any type of terrain. This is because it's a high-quality pipe through and through, and can be made to meet these specifications—API-5Lx42, ASTM A-139, and ASTM A-134.

Bethlehem Oil and Gas Pipe comes in 40-ft lengths, with either beveled or straight ends, and in diameters from 22 in. up to the maximum permitted by shipping clearances. Diameters up to 36 in. have one longitudinal and one girth seam; sizes greater than 36 in. have two longitudinal seams. Welding is done by the automatic submerged-arc process. What's more, our completely-equipped shop has facilities to meet practically every requirement, including grit-blasting, priming, enameling, and wrapping, as well as the making of Tees, Crosses, and related fittings.

Why not look into the possibilities of Bethlehem Oil and Gas Pipe? Additional information is available from the nearest Bethlehem sales office—or get in touch with us at Bethlehem, Pa.

★ BETHLEHEM STEEL ★

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

FABRICATED STEEL CONSTRUCTION

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM OIL AND GAS PIPE

The Oil and Gas Journal, published Thursdays by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $3 yearly. Copyright 1950.

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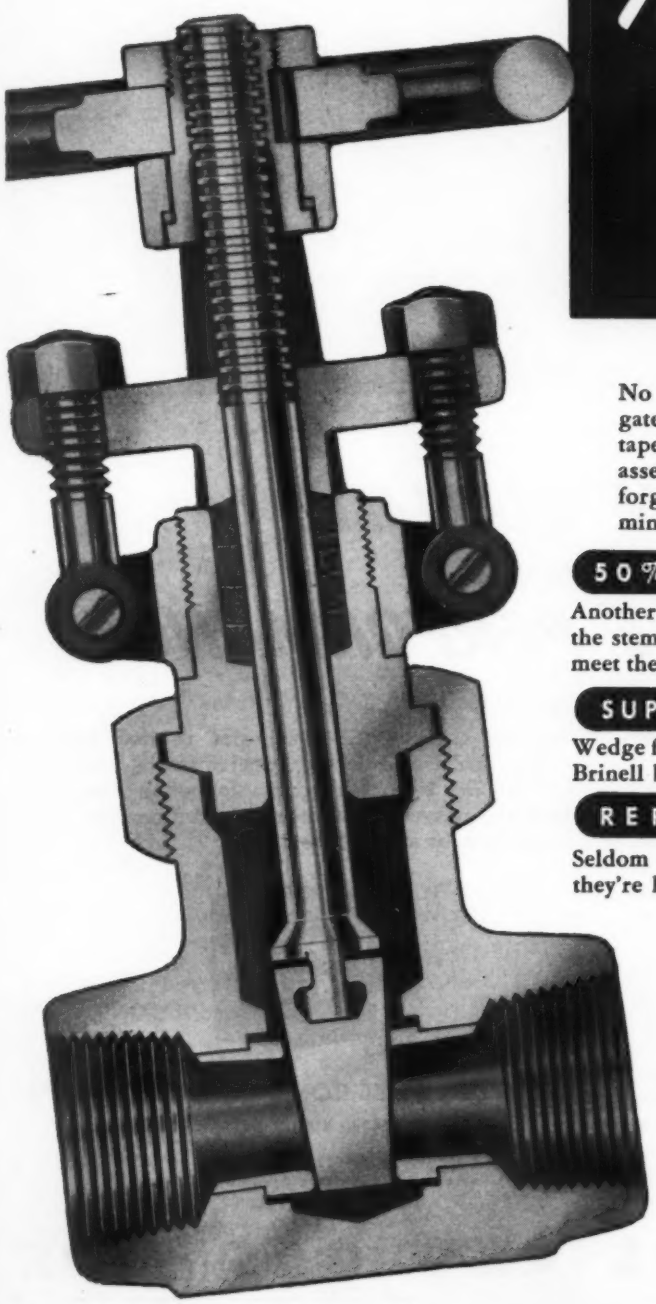
IF IT'S A

CHAPMAN 960

YOU CAN

Repack Under Full Pressure



No need to interrupt service to repack this small gate valve. You can do it under full pressure, for a tapered shoulder is provided on the stem and gate assembly which engages a seat in the bonnet forging. You repack easily, quickly — with minimum trouble.

50% STRONGER CONNECTION!

Another trouble-saver is the extra-strength now built into the stem and wedge gate connection. It's 50% stronger to meet the most extreme operating conditions.

SUPER-HARDENED WEDGE FACES!

Wedge faces, too, are extra strong — super-hardened to 800 Brinell by the exclusive Malcomizing process.

REPLACEABLE SEAT RINGS!

Seldom is replacement of these seat rings required, for they're hard heat treated — made with wear resisting and non-galling properties. But, if ever necessary, they're made so you can do the job easily...fast.

Specify List 960 in sizes ¼" to 2". Rising stem with yoke (illustrated) or rising stem inside screw type. For pressure range 2000 lbs. at 100 deg. F., 380 lbs. at 1000 deg. F. For higher pressures specify List 990.

The Chapman Valve Manufacturing Company

INDIAN ORCHARD, MASSACHUSETTS

CORROSION PLAYS NO FAVORITES

CHEMICAL INDUSTRIES

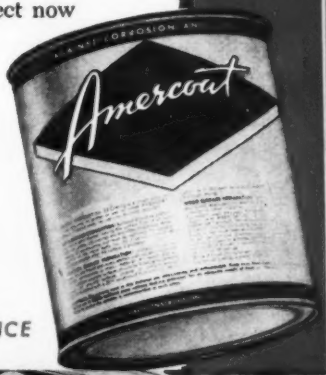
PETROLEUM INDUSTRY

You must PROTECT *or* PAY
...you have no other choice

No business escapes the effects of corrosion. It costs industry over $6,000,000,000.00 annually. Yet much of this costly damage might be avoided by taking just two simple steps—

1. Check the danger points in your plant—manufacturing equipment, piping, valves, tanks, motors, and all similar items.
2. Protect them with Amercoat—the corrosion-resistant coatings; each designed to meet specific conditions.

Most conventional coatings fail when corrosion threatens, because they are neither designed nor suited for severe service. Don't risk needless loss—protect now with Amercoat.



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A Division of
American Pipe and Construction Co.
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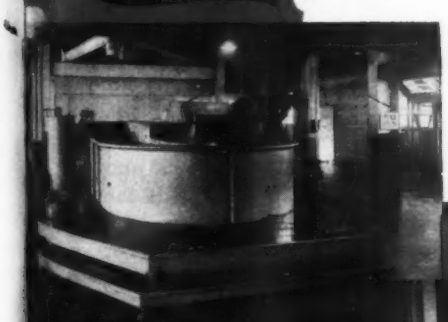
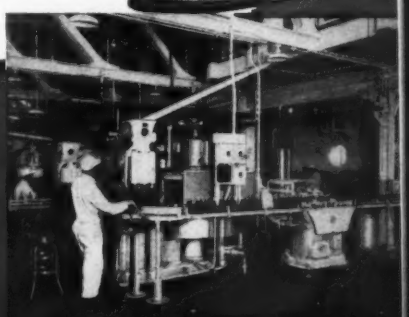
FOLLOW THE LINE OF *most* RESISTANCE

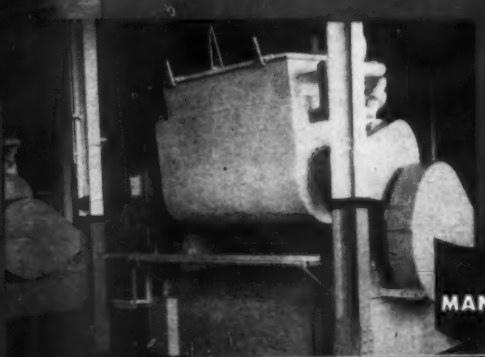
MEAT PACKING



PAPER MILLS



BEVERAGE PLANTS



RAYON MANUFACTURING

IN TIME WITH THE TIMES . . .

NEW ROCKWELL CHART DRIVES

FOR ALL METERS, CONTROLS, RECORDERS

THE *MIGHTY* MIDGET

Rockwell Midget chart drives fill the need for small size, powerful drives in instruments where space is at a premium. These drives are compact, strongly constructed and designed for years of service. In no other drive will be found the same combination of size, adaptability and quality. Rockwell Midgets feature a detachable escapement (sealed in transparent plastic). They wind through the chart arbor and snap mount into separate ring that may be positioned on bosses or adaptors to fit any instrument case.

24 HOUR MIDGET DRIVE

The 24-hour Rockwell Midget is 24-hour rotation only, with a 48-hour rundown. The 8-day drive is basically 24-hour rotation. Turrets are available to give ten alternate rotation speeds ranging from 2-hour to 8-day.

8 DAY MIDGET DRIVE

Illustrating how turrets lock onto the chart arbor to change rotation speeds. This same conversion convenience is obtainable on the 8-day Midget drive.

There are two basic models of the Standard type—24-hour rotation, 8-day wind; 7-day rotation, 31-day wind. A power drive is available for use where more than the usual amount of torque is required. Built as specified in rotations of 1, 2, 3, 4, 6, 8, 12 hours. Turrets provide a selection of 10 alternate speeds.

STANDARD TYPE with Speed-Lok chart hub

THE *VERSATILE* STANDARD

Since the Rockwell Standard is thinner than most other drives, it may be readily used as a replacement in practically any instrument. This is accomplished by means of adaptors which correctly locate the drive both as to position and height.

Rotation speeds present no problem either. Speed changing turrets lock into place on the chart arbor to provide the desired rotation cycle.

Such versatility in application makes the Rockwell Standard the most economical chart drive you can use. You'll save on inventory, in service and in reduced maintenance expense.

Attractive factory repair program — WRITE FOR BULLETIN NO. 1079

ROCKWELL MANUFACTURING COMPANY

Pittsburgh 8, Pa.

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Don't buy a V-Belt Drive unless–

1. the sheave comes in two parts for easy mounting—separately or as one-piece assembly[a]

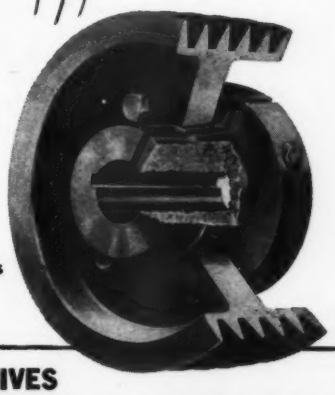
2. the hub and rim are "taper-mated", for friction cone grip and positive press fit on shaft[b]

3. the clamped hub holds shaft position when rim size is changed—no realignment problem[a]

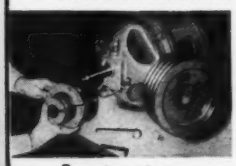
4. I-beam spokes on driven sheave help carry heavier load with less weight[a]

5. the belt carries the load with minimum internal friction[c]

a Worthington exclusive
b Worthington original
c Worthington-Goodyear original—endless load-carrying cords in neutral axis



WORTHINGTON MULTI-V-DRIVES



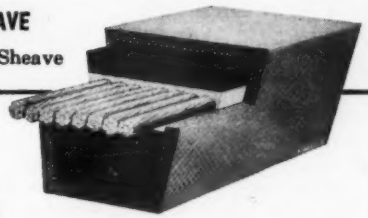
Easy to get on

Easy to get off

Yet always tight on the shaft

WORTHINGTON QD SHEAVE

Original Tapered Cone-Grip Sheave



WORTHINGTON-GOODYEAR EC CORD V-BELTS

Each endless cord carries an equal share of the belt load—each belt, matched and uniform in length, carries an equal share of the drive load.

Send coupon for latest Worthington QD Sheave bulletin, V1400B7F

Complete Range of QD Stock Sizes— Prompt Shipment 853 listed stock sizes in "A", "B", "C", and "D" sections fhp to 600 hp... 332 listed stock sizes of EC Cord V-belts.

It was a crisis that occurs only on Saturday mornings

Minutes before noon on a Saturday morning, a frantic call to **Oberjuerge Rubber Distributing Co.**, St. Louis, Mo. reported a motor failure at a brickyard.

A week's stoppage of production was threatened.

A different motor was available, but not the right rpm.

Could Oberjuerge furnish belts and sheaves to give the proper speed? Answer (after some quick calculations): yes—two Worthington QD Sheaves, 8 groove, 16 in. driver, 58 in. driven, with a set of 8 Worthington-Goodyear V-Belts.

By mid-afternoon, the brickyard was back in production. Again, a Worthington distributor had saved the day—or, in this case, a week!

WORTHINGTON

ORIGINATORS OF THE QD SHEAVE
WORTHINGTON PUMP AND MACHINERY CORPORATION
MULTI-V-DRIVE SALES DIVISION
Buffalo, N. Y. • *General Offices:* Harrison, N. J.

The Good Right Hand of Industry

POWER TRANSMISSION: sheaves, V-belts, variable speed drives
PUMPS: centrifugal, power, rotary, steam
AIR COMPRESSORS: water-cooled, air-cooled

Worthington Pump and Machinery Corp.
Multi-V-Drive Sales Division,
Buffalo, New York

Send Bulletin V1400B7F on Worthington Multi-V-Drives.

Name.....
Company.....
Address.....
City.....Zone....State.....

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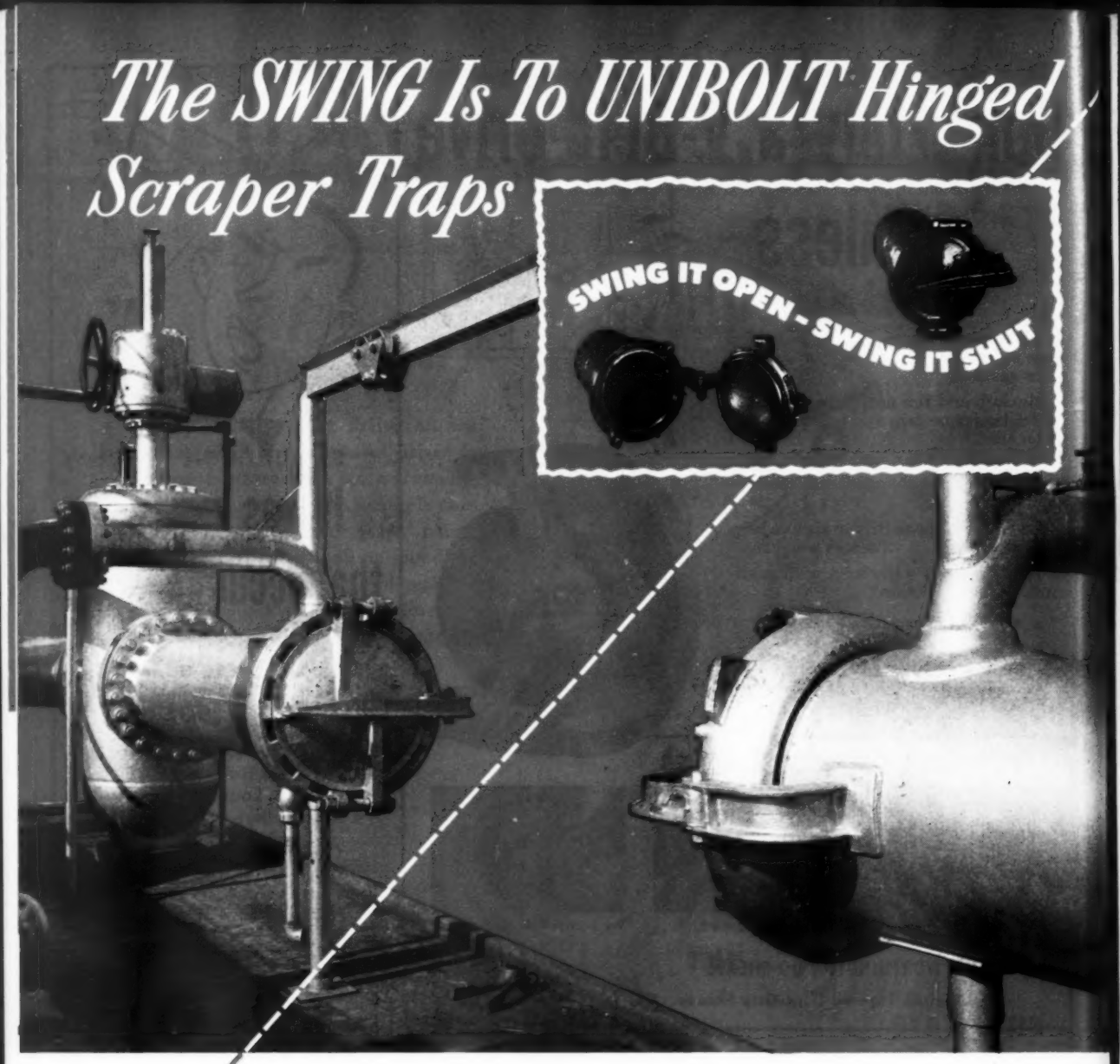
The SWING Is To UNIBOLT Hinged Scraper Traps



Opening the UNIBOLT Hinged Scraper Trap requires two simple operations: Release two bolts; swing the hinged Blanking Plug open. Just as quickly, you can reverse the operation: Swing the Plug shut and tighten the two bolts. No heavy lifting. No danger of injuries through dropping a heavy closure. This compact UNIBOLT Hinged Scraper Trap takes the place of heavy, multi-bolt blind flange closures and leaky-thread bull plugs. And in addition to its economy, safety, and operating convenience UNIBOLT gives you a better closure, a tighter closure with longer life.

UNIBOLT

Any line or unit that requires closures, such as strainers, blowdowns, scrubbers, mist removers, and similar pressure vessels, may be UNIBOLT-equipped to real advantage. Wherever a blind flange is applicable, a UNIBOLT Coupling with Blanking Plug will do the job better—seal tighter, reduce weight, and save time.

UNIBOLT THE ONE BOLT COUPLING

THORNHILL-CRAVER COMPANY • HOUSTON, TEXAS

MANU
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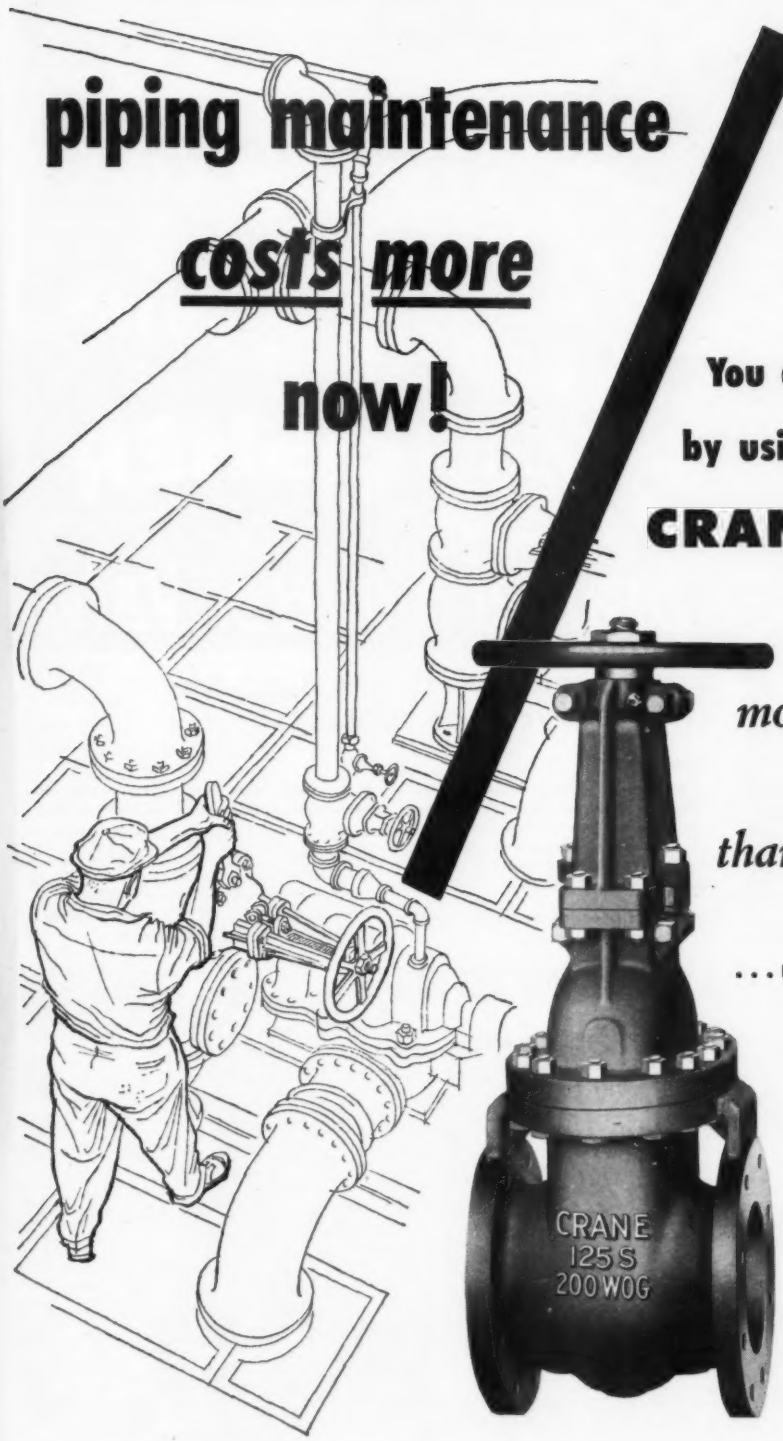
piping maintenance costs more now!



You do less of it

by using Dependable Quality

CRANE VALVES

That's why more Crane Valves are used than any other make

. . . no bonnet trouble with this valve

A typical example of low-maintenance Crane Quality—No. 465½ 125-Pound Iron Body Gates. Rarely does the bonnet joint need attention. Flange construction includes reinforcement to prevent distortion and utilizes more bolts, more closely spaced than is usual in valves of this class. Crane precision-guided seating reduces seat and disc wear. Packing has long life because these valves have a deep stuffing box filled with high grade asbestos ring packing. A ball-type gland equalizes the packing load.

Better performance features like these make Crane the better buy in valves of every type. Ask your Crane Representative for a demonstration.

CRANE

CRANE CO., *General Offices:*
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

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A Natural for
FLASHING OR EROSIVE SERVICE

New FISHER®
Drainer Control Valve

FOR OPERATION BY PRESSURE OR LIQUID LEVEL CONTROLLERS

Features:

- Angle body construction with renewable chrome nickel stainless steel seat ring. Directs flow directly into outlet piping. Protects body from contact with high velocity flashing fluids—preventing body washout difficulties.
- Easily dismantled for replacing worn internal parts
- Available with heavy duty or conventional positive alignment inner valve guiding.
- Iron or steel flanged angle body construction in sizes 1", 2", 3", 4" and 6".
- Operated by suitable super-structure to overcome pressure unbalance conditions.
- Furnished with Fisher Teflon V-Ring Packing. Requires no lubrication.

HEAVY-DUTY GUIDING
or
CONVENTIONAL GUIDING

Fisher Governor Company
MARSHALLTOWN, IOWA

There's no substitute for [illegible] hole...

thats why

Joe Wyant selects MURPHY DIESEL POWER for his own rigs

AS drilling superintendent for other drillers, Joe Wyant of Guyman, Oaklahoma, had a chance to learn first hand how Murphy Diesels perform on drilling rigs. So it was natural for him to select a Murphy Diesel powered rig when he recently began contracting with his own equipment. A second rig added later was also Murphy powered.

If you want real performance on your rig, find out more about Murphy Diesel Power . . ask Murphy owners for their opinions and write for a copy of the booklet *"10 Questions to Ask a Diesel Engine Salesman."*

MURPHY DIESEL COMPANY
5305 W. Burnham St., Milwaukee 14, Wisconsin
OIL INDUSTRY FACTORY BRANCH—Sales, Parts and Service:
113-117 South Elwood Street, Tulsa, Oklahoma

MURPHY DIESEL

Heavy duty power
for the oilfields

Murphy Diesel Engines and Power Units for drilling and pipe line pumping, 90 to 220 H.P. Generator Sets 60 to 133 K.W.

Or See Your Nearest Dealer

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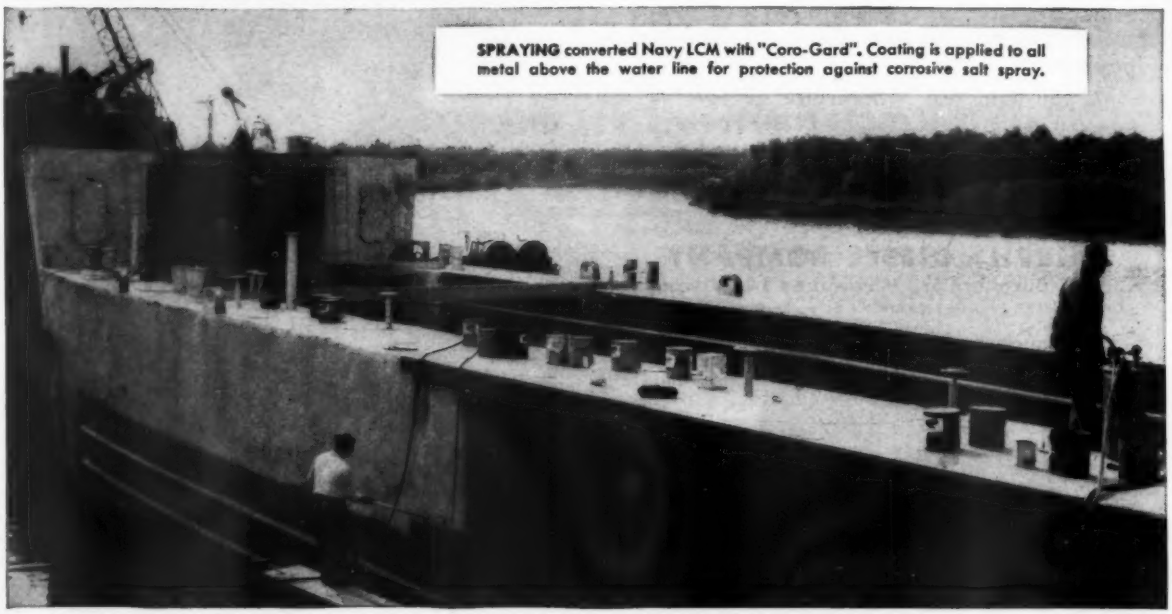
Lasting protection for off-shore drill equipment

Drill rigs and boats coated with "Coro-Gard" for longer life in corrosive salt waters

Now "Coro-Gard" protects drill rigs seven miles at sea—and their supply boats! Salt spray, immersion, high humidity, crude oil, rain squalls, and scorching sun have no effect on this tough anti-corrosive coating. Actual operating tests by a Gulf Coast oil company prove that "Coro-Gard" cuts expensive maintenance costs, requires less re-coating, gives long protection.

Whatever your corrosion problem, there's a "Coro-Gard" Coating System to save *you* time and money. Our engineers have prepared coating systems to satisfy every need. Write today for complete information.



SPRAYING converted Navy LCM with "Coro-Gard". Coating is applied to all metal above the water line for protection against corrosive salt spray.

Minnesota Mining & Mfg. Co.,
Adhesives & Coatings Division
411 Piquette Avenue
Detroit 2, Mich. Dept. OG-115

Please send my copy of "Coro-Gard Protective Coatings."

NAME_____

COMPANY_____ TITLE_____

ADDRESS_____

CITY_____ STATE_____

FREE FOLDER! Gives actual samples of colors and finishes for 15 basic metal-protective coating systems. It shows how "Coro-Gard" cuts the cost of treating equipment, prolongs the interval between coating and re-coating. For your FREE copy, use coupon above.

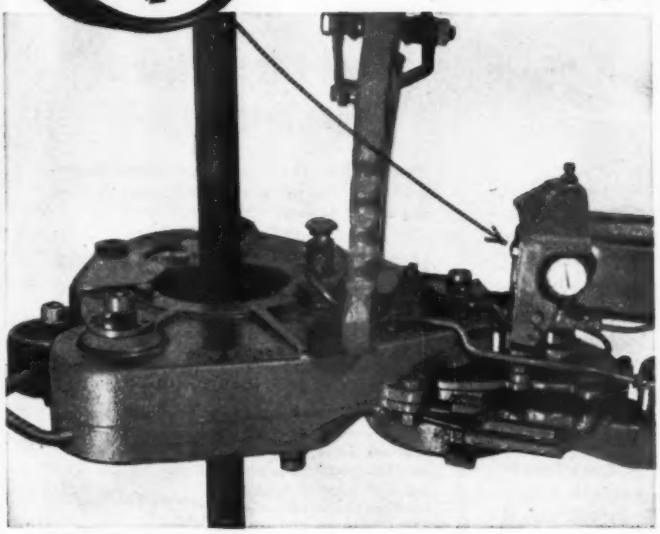
Made in U.S.A. by MINNESOTA MINING & MFG. CO., ADHESIVES AND COATINGS DIV., 411 Piquette Ave., Detroit 2, Mich. Also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives. General Offices: Saint Paul 6, Minnesota. General Export: Durez Abrasives Corp., New Rochelle, N. Y. In Canada: Canadian Durez Abrasives Ltd., Brantford, Ontario.

MEASURED MAKE-UP on every joint with this

BJ POWAIRMATIC TUBING TONG

makes short work of tubing jobs

BJ's Torque Indicator on the PowAIRmatic Tubing Tong *automatically* controls joint make-up on every tubing stand. It's an exclusive feature on the PowAIRmatic that safeguards against costly joint and collar leaks . . . reduces chance of galled, bottle-necked and crushed tubing . . . enables you to run tubing *faster* without costly guesswork!



But that's not the whole story! The PowAIRmatic Tubing Tong is a money-saver throughout your well-pulling operation.

It's more powerful—gives fast, positive make-and-break operation . . .

It's fast—requires no manual positioning, swings on and off the pipe instantly, spins-up at 60 rpm . . .

It's versatile—spring-locked roll-over hanger provides instant reversal for testing, backing off.

The BJ PowAIRmatic is the ideal cost-cutting tool for *all* your work-over jobs. Interchangeable jaws and bushings handle tubing and drill pipe from 1¼" through 3½" O. D., and are installed for different pipe sizes by removing a single pin. Husky, full-length dies provide maximum gripping area. Two-speed sealed-in-oil transmission and chain drive deliver full, efficient power. The PowAIRmatic is available with or without air compressor . . . *Ask the BJ representative nearest you for a demonstration—today—and write for bulletin giving full details.*

Simple adjustment of a pop-off valve accurately controls make-up for any size tubing. Once the valve is adjusted by the operator (from air pressure vs. torque data contained near the indicator dial) the PowAIRmatic delivers the exact torque required for proper tubing make-up. Indicator dial permits quick readings of torque make-up on each joint.

BJ BRAND ENGINEERED PATOOLS

Byron Jackson Co.

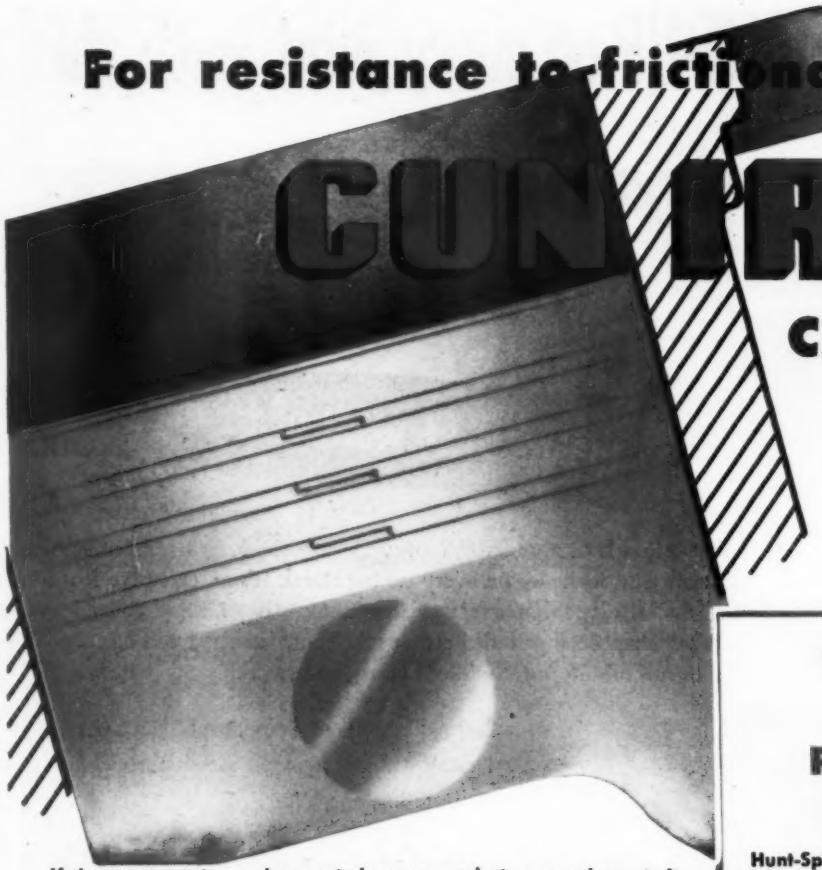
Since 1872

P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif.

Offices in Principal Cities

For resistance to frictional wear...

GUN IRON CASTINGS



If there are cast wearing parts in your products or equipment, it will pay you to investigate the advantages of Gun Iron. Since its original development over 139 years ago, Gun Iron and its alloys have proved superior for wear resistance on literally thousands of different applications.

Taking one industry as an example, Gun Iron is used for steam locomotive cylinder and valve packing rings and bushings, cross-head shoes and rod bushings to name a few. On all of these, friction is extremely severe due to irregular lubrication. Because of the exceptional performance of Gun Iron, it is specified for these parts by most leading engine manufacturers and railroads.

Gun Iron is produced in air furnaces similar to steel open hearth furnaces and has a dense, close-grained, 100% pearlite micro-structure with an even distribution of flake graphite throughout. It also has exceptional resistance to high heat, impact, corrosion and erosion and damps vibration more effectively than other irons. Our engineers and metallurgists are at your disposal to discuss the application of Gun Iron to your strategic cast parts . . . our furnaces, foundry and extensive machining facilities stand ready to produce them accurately and economically. Why not write for more details today?

GUN IRON *in the* PETROLEUM INDUSTRY

Hunt-Spiller casts and machines many parts for the petroleum industry. A few are listed below:

LINERS, PISTONS AND RINGS FOR HOT OIL PUMPS • BUBBLE CAPS AND TRAYS • TUBE SUPPORTS • PRESSURE CASTINGS

Chances are that there are many other places where Gun Iron can solve a design or operating problem. To help you determine the value of Gun Iron for your cast parts, our metallurgical department has prepared a comprehensive bulletin which contains complete properties and discussions of Gun Iron and many other metals. Engineers claim it an invaluable reference aid. Send for your free copy today.

HUNT • SPILLER GUN IRON • AIR FURNACE PROCESS •

HUNT • SPILLER

MANUFACTURING CORPORATION

393 DORCHESTER AVENUE • SOUTH BOSTON 27, MASS.

Canadian Representatives: Joseph Robb & Co., Ltd., 4050 Namur St., Montreal 16, P. Q.

ESTERON *BRUSH KILLER*

Today, miles of right-of-way are cleared with Esteron Brush Killer. This widely used Dow formulation now contains more powerful, less volatile esters of 2,4-D and 2,4,5-T. It is effective against a wider variety of brush and weeds such as alder, ash, birch, brambles, cherry, elm, hickory, maple, oaks, osage orange, poison ivy, sumac, willow and other hard-to-kill species—also prevents resprouting of stubs and stumps.

Dow research has approached brush control problems *from your side.* We can offer valuable assistance to help you decrease clearing costs—simplify maintenance—and patrolling of the pipelines.

Your inquiries are invited.

Agricultural Chemical Division

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

Esteron 245 is also recommended for control of certain 2,4-D-resistant woody plants. Where brush is not a problem—2-4 Dow Weed Killer, Formula 40 controls annual and perennial weeds growing in right-of-ways and around tank farms and booster stations. For controlling Johnson, quack, Bermuda and other perennial and annual grasses—use Dow Sodium TCA 90%. No fire hazard!

DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE

USE DEPENDABLE DOW AGRICULTURAL CHEMICAL PRODUCTS

WEED AND GRASS KILLERS • INSECTICIDES • FUNGICIDES
SEED PROTECTANT • PLANT GROWTH REGULATORS
GRAIN AND SOIL FUMIGANTS • WOOD PRESERVATIVE

XUM

J&L Wire Rope fits Loaders and Shovels "like a glove."

Precisionbilt J&L Wire Rope means greater safety on truck and tractor winches.

Save on Wire Rope EVERYWHERE with J&L STEEL

J&L Wire Rope is safer to use, lasts longer, costs less on every oil country job.

You can't wash Bronz-Lube off J&L Wire Rope. Permanent lubrication means longer rope life.

Line pipe work has been taken here as an example. Substitute any other oil country load on the equipment shown in these pictures and the results are the same—reduced rope costs wherever J&L Wire Rope is used. Bronz-Lube assures permanent lubrication. Precisionbilt guarantees safety and uniformity through precision manufacture.

On all your oil country work—from stringing your rigs to rigging your winches—get the savings offered by J&L Wire Rope. Conveniently available through your nearby Jones & Laughlin Supply store.

80 Stores
also
17 Sales Offices
and
8 Resident Salesmen

"... here's MY warehouse!"

Jones & Laughlin Supply Company

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION MEMBER

Subsidiary of
Jones & Laughlin
Steel Corporation
TULSA, OKLAHOMA

AL

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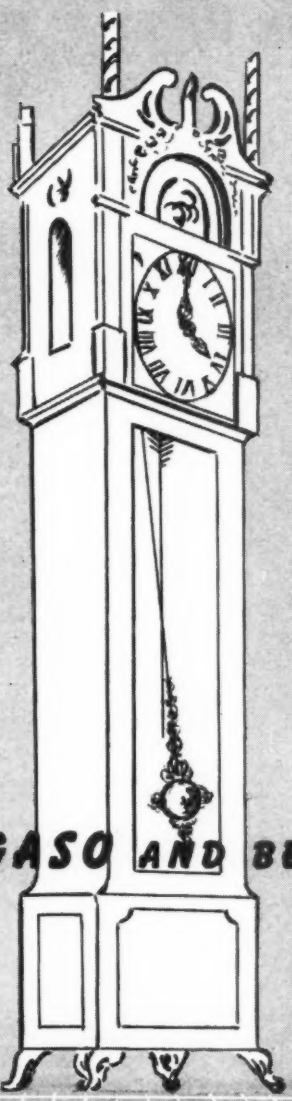


Old Age commands respect

Hundreds of "over-age" Gaso Pumps in the field tell a daily story of stamina—a story of pumps so dependable, so strong in every part, that they continue to function perfectly for almost unbelievable periods of time.

SAY **GASO** AND BE **SURE!**

GASO PUMPS

for every oil industry need

GASO PUMP & BURNER MFG. CO. 902 EAST FIRST ST., TULSA, OKLA.
EXPORT OFFICE: 149 BROADWAY, NEW YORK

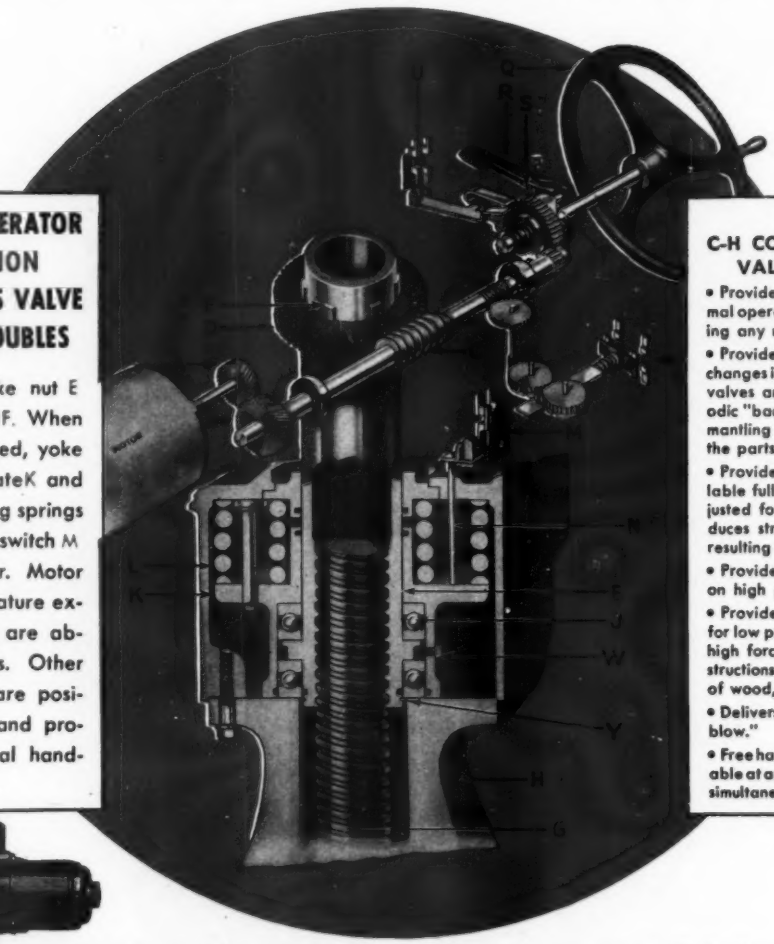
Shreveport: W. L. SOMNER CO., 419 Lake Street • Los Angeles: 2529 Chambers St., Vernon • Western Canada: Lufkin Machine Co., Ltd., Edmonton, Alberta

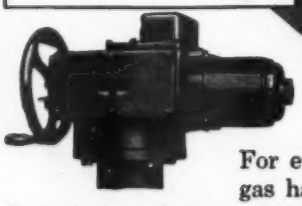
XUM

BETTER . . . SAFER . . . SURER
VALVE OPERATION
FOR EVERY PETROLEUM INDUSTRY NEED

THE VALVE OPERATOR CONSTRUCTION THAT PREVENTS VALVE JAMMING TROUBLES

Motor drives yoke nut E thru A, B, C, D and F. When valve disc is seated, yoke nut rises, lifting plate K and rod N, compressing springs L and operating switch M which stops motor. Motor drift, and temperature expansion of stem, are absorbed in springs. Other elements shown are position limit switch and provision for optional hand-wheel operation.





Features of
C-H CONTROLLED THRUST VALVE OPERATORS

- Provides tight closure under normal operating conditions, eliminating any need for "final" seating.
- Provides for large temperature changes in high temperature steam valves and gas valves. No periodic "back off" necessary. No dismantling of valve to "unfreeze" the parts.
- Provides for accurately controllable full power drive, easily adjusted for service conditions. Reduces strain and wear and tear resulting from other systems.
- Provides high speed operation on high pressure valves as well.
- Provides ADEQUATE Protection for low pressure valves . . . against high forces, against artificial obstructions such as gravel, a piece of wood, etc., in the valve.
- Delivers an unseating "hammer blow."
- Free hand-wheel operation available at any time. Protected against simultaneous electrical operation.

For every problem of oil and gas handling from production through the refining processes and out across the pipe line networks, the *controlled thrust* principle of Cutler-Hammer Motorized Valve Operators gives these definite advantages for all kinds of valves:

It *always* assures a tightly seated valve regardless of the frictional condition of the valve stem or the driving mechanism.

It *definitely* prevents damage to a valve from the expansion and contraction of valve parts under extremes of temperature.

It *unfailingly* provides correct seating no matter how swiftly the valve is closed, and it prevents damage in case foreign matter lodges in the valve.

Cutler-Hammer *controlled thrust* Valve Operators gain their superiority through what may be called a transferable fulcrum. They drive through a yoke nut fulcrum established by heavy steel springs whose compression is equal to the desired tight seating pressure. When the valve is accurately seated, the *seat* becomes the fulcrum, the yoke nut retracts, opening the motor circuit, and motor drift is absorbed by the springs. Moreover, the same accurate seating is maintained as valve parts expand and contract.

Now is the time to investigate this proven superior motorized valve operator for your needs. Available as standard equipment on all leading makes of valves . . . . . CUTLER-HAMMER, Inc., 1453 St. Paul Ave., Milwaukee 1, Wis.

CUTLER-HAMMER
VALVE CONTROL
C-H

The Car That Gets You Through When Others Can't

The 4-WHEEL-DRIVE WILLYS STATION WAGON

When the going is toughest—when the chips are down—you can depend on the 4-Wheel-Drive Willys Station Wagon. All-wheel traction plus the surging power of its high-compression HURRICANE Engine takes you through.

There are seats for six passengers with ample space for luggage, tools and equipment. Lift out the rear seats and you have 98 cubic feet of hauling space. Ask your Willys dealer to demonstrate this "go-anywhere" 4-Wheel-Drive Willys Station Wagon.

POWER ON ALL FOUR WHEELS takes this Willys Station Wagon through mud and sand, over snow and ice. It climbs grades up to 66%. Rugged construction and high-clearance fenders make it ideal for travel in rough, open country.

WILLYS-OVERLAND MOTORS, TOLEDO 1, OHIO • WORLD'S LARGEST MAKERS OF 4-WHEEL DRIVE VEHICLES

XUM

low-cost process heat

dependable low-speed power

GET BOTH with G-E

If your plant uses process steam, you may be able to improve over-all heat balance by driving low-speed equipment with General Electric geared turbines. Mechanical drive turbines act as reducing valves to drop boiler steam pressures down to utilization temperatures for process requirements. With turbines skimming off only a small portion of the steam's heat, mechanical power for driving fans, blowers, pumps and other low-speed apparatus is almost free.

Standard Type DP and DR turbines, combined with General Electric precision-type gears, are ideal for many such applications.

PRECISION GEARING

General Electric balanced-thrust gears are specifically designed for use with turbine drives. Smoothness and quietness of operation are the result of maintaining tooth contours and spacing to a high degree of accuracy.

Positive lubrication assures long life. Oil is delivered to the bearings from a gear-type pump driven by the pinion shaft. The gear mesh is spray-lubricated.

To meet a variety of application requirements, these gears are available in ratios from 1.5 to 10.3.

PRECISION GOVERNING

General Electric Type DP and DR turbines include extra features at no extra cost. The DP's hydraulic governing system provides a speed range of 30 per cent with 6 per cent regulation. The DR's oil-relayed governor offers speed ranges up to 5 to 1 with accuracy of ¼ of 1 per cent. Each turbine has its easily operated trip-throttle valve and governing valve combined in one compact unit. Rugged construction from quality materials makes these standard turbines outstanding for reliability and efficiency.

ONE INTEGRAL UNIT

General Electric close-coupled turbine-gear sets have one common turbine and pinion shaft, with the turbine and gear casings solidly connected by a sturdy fabricated bracket. This construction results in a compact unit, does not require high-speed coupling.

Many standard parts are interchangeable with other turbine and turbine-gear drives.

Your nearby General Electric sales office will supply you with full details about mechanical-drive turbine-gear sets. Or, if you prefer, write for free copies of illustrated bulletins on these drives. The DP and DR turbines are described in bulletins GEA-4955 and GEA-5193. Bulletin GEA-5152 contains information about gears. Learn how installing these precision drives in your plant can save you money. Apparatus Department, General Electric Company, Schenectady 5, N. Y.

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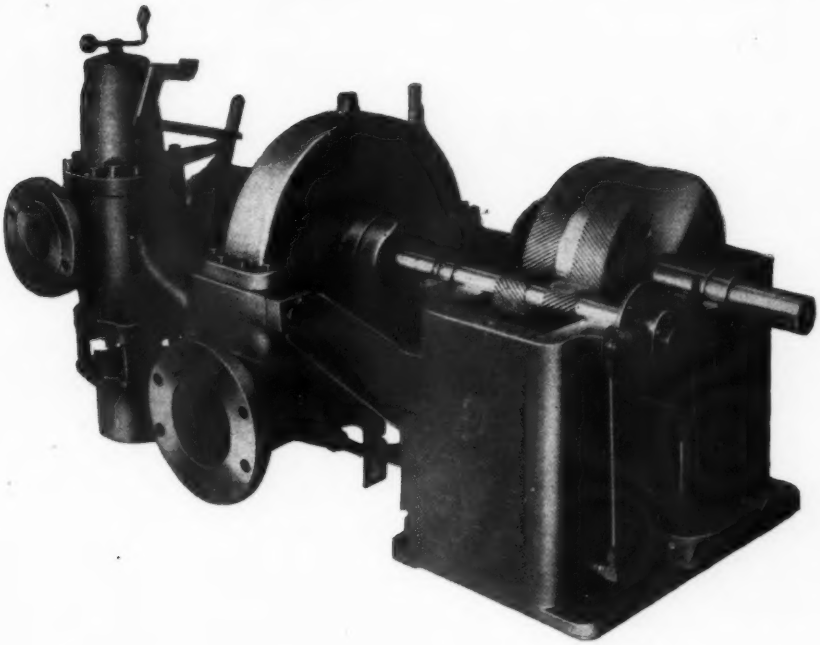
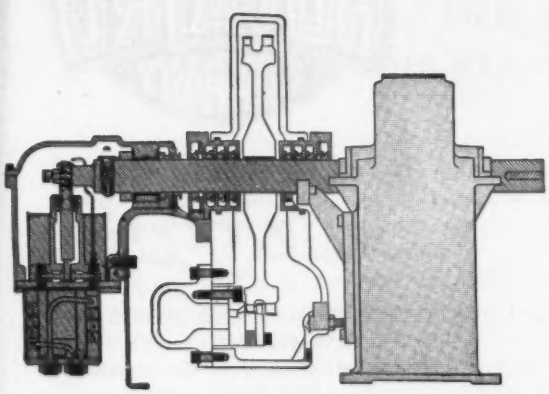


TURBINE-GEAR DRIVES



HERE'S WHAT STANDARDIZATION PROVIDES FOR YOU

This diagram shows how a standard DP turbine is close-coupled to a low-speed gear using an integral turbine and pinion shaft. All shaded turbine parts are interchangeable on all sizes of DP turbines. Thus, it is easy to stock spares, and maintenance costs are reduced. All individual turbine models and gear sets have standard shaft heights for easy installation or re-location in your plant. In addition, standardization cuts manufacturing expense, and the savings are passed on to you in the form of extra features usually found only on "special" turbine-gear drives.

GENERAL ELECTRIC

252-47

XUM

You'll have your SUPPLY PROBLEMS Well in Hand..

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION MEMBER

WHEN YOU "Buy From Bovaird"

At your friendly Bovaird Supply Store, you will find an experienced staff capable of helping you with your supply needs. To serve you and assure you of a dependable source of supply for nationally known brands has always been our objective. There are 22 Bovaird Supply Stores and Offices strategically located in the Mid-Continent Area, well stocked and at your service.

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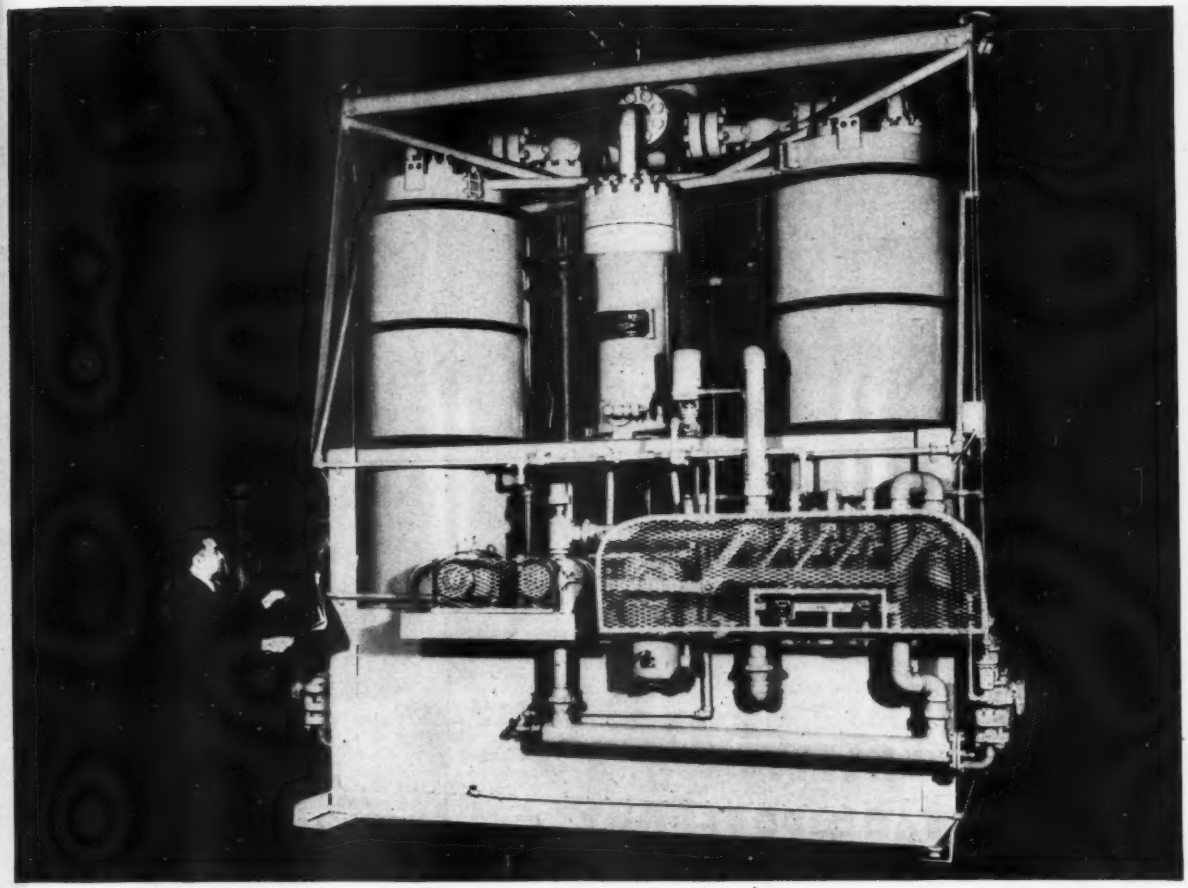
ILLINOIS—Clay City, Grayville, Salem
KANSAS—Chase, Great Bend, McPherson, Pratt, Russell, Wichita
OKLAHOMA—Duncan, Oklahoma City, Pauls Valley, Ringwood, Sapulpa, Seminole, Tulsa
TEXAS—Borger, Dallas, Midland, Odessa, Pampa, Snyder

THE Bovaird SUPPLY CO.

GENERAL OFFICES
TULSA, OKLAHOMA



for DRYing at 5,000 psi.

A PACKAGED UNIT, READY TO CONNECT UP AND RUN

You probably work at much lower pressures, but this shows what can be done with Lectrodryers. So big it had to be shipped on a depressed-bottom car, it only needs connecting to feed lines and it's ready for action.

Fully automatic, it reverses the DRYing-regenerating cycle at predetermined intervals. And it will go on doing a safe, efficient DRYing job year after year, with practically no attention. Thousands of Lectrodryers in service all over the world, in every kind of industry, have demonstrated this fact.

Whatever your DRYing problem—air, gases or organic liquids—there's a Lectrodryer for the task. No need for your engineers to take time to design and supervise the building of a special machine. Usually, a standard Lectrodryer can be adapted to your requirements. If not, we'll build the special machine you need.

Write, telling your DRYing problem, to Pittsburgh Lectrodryer Corporation, 325 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

REGISTERED TRADEMARK U.S. PAT. OFF.

MOVING FREELY TOWARD FREEPORT...

Another Republic Electric Weld Pipe Line—Over 80 Miles Long

Straight, long lengths go into the ditch freely, moving jobs with greater strides . . . high ductility steel makes field bending easy and sure . . . uniform roundness, diameter and wall thickness make pipe ends match perfectly for fast welding. These are some of the reasons why this 4½" Republic Electric Weld Pipe Line moved freely through Waller County on its way to Freeport, Texas.

Check all ten field-proved qualities listed at right. They are the real reasons why more than 55,000 miles of Republic Electric Weld Line Pipe has been placed in service over the past twenty-one years—the reasons why this advanced line pipe today provides dependable, trouble-free transportation for crudes, gasoline, natural gas and by-products.

1. **UNIFORM ROUNDNESS**—Pipe ends match up perfectly—speed construction—cut costs.
2. **UNIFORM DIAMETER**—No "off-size" lengths to cause welding difficulties at joints.
3. **UNIFORM WALL THICKNESS**—Absolute dependability throughout every inch of length and circumference.
4. **UNIFORM HIGH YIELD STRENGTH**—Permits building of higher pressure lines—utilizing design values to fullest advantage.
5. **UNIFORMLY STRAIGHT**—Lengths line up evenly—go into the ditch freely.
6. **EASY TO BEND**—High-ductility steel makes bending in the field easy.
7. **EASY TO WELD**—Low carbon steel welds readily—makes sound joints.
8. **FREEDOM FROM SCALE**—Insures against clogged valves, contamination of petroleum products.
9. **LONG LENGTHS**—Reduces number of joints—makes jobs move with longer strides.
10. **INSPECTED INSIDE AND OUT**—Republic Electric Weld Line Pipe is made from flat-rolled steel both sides of which are closely inspected. Thus, you are assured that the surface which becomes the inside wall when formed into pipe is free from hidden defects.

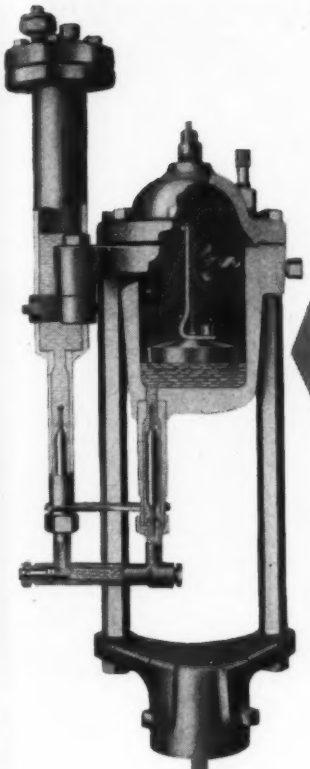
Write for descriptive literature.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Bldg., New York 17, N.Y.

REPUBLIC STEEL

Republic
ELECTRIC WELD LINE PIPE

Other Republic Products include Casing and Tubing—Carbon, Alloy and Stainless Steels—Studs, Bolts and Nuts—Heat Exchanger Tubes



Proper float location gives you EXTRA METER VALUE

HERE'S HOW TEMPERATURE ERRORS ARE CANCELED

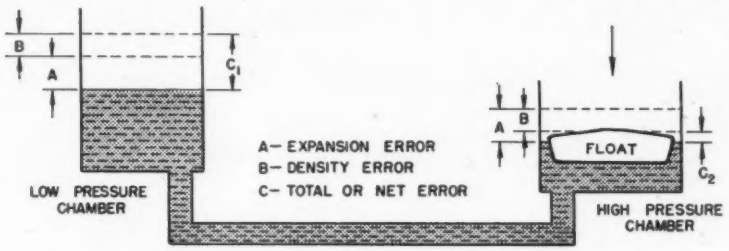
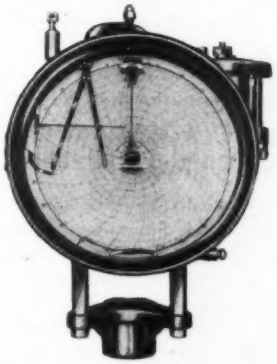


Diagram shows two distinct ambient temperature error factors (exaggerated for clarity) which affect the accuracy of mercury displacement type flow meters. On an increase in temperature, for example, the mercury expands and its level rises an equal amount (A) in both high and low pressure chambers. Mercury density also decreases because of the same increase in temperature, resulting in increased displacement (B) for a given differential pressure change. This increased displacement adds to error (A) in the low pressure chamber, causing a combined error C_1 — but *subtracts* from error (A) in the high pressure chamber, leaving only a negligible net error (C_2).

Better Design Throughout Assures Greater Accuracy with Foxboro Meters

Engineering thoroughness in every detail throughout Foxboro Flow Meters demonstrates conclusively why you get *extra meter value*. Locating the meter float in the high-pressure chamber is only one of many examples. Based on broader understanding of basic principles, this simple design feature utilizes two inherent sources of thermal error to offset each other. The result is highest sustained accuracy through the range of the instrument, regardless of temperature variations.

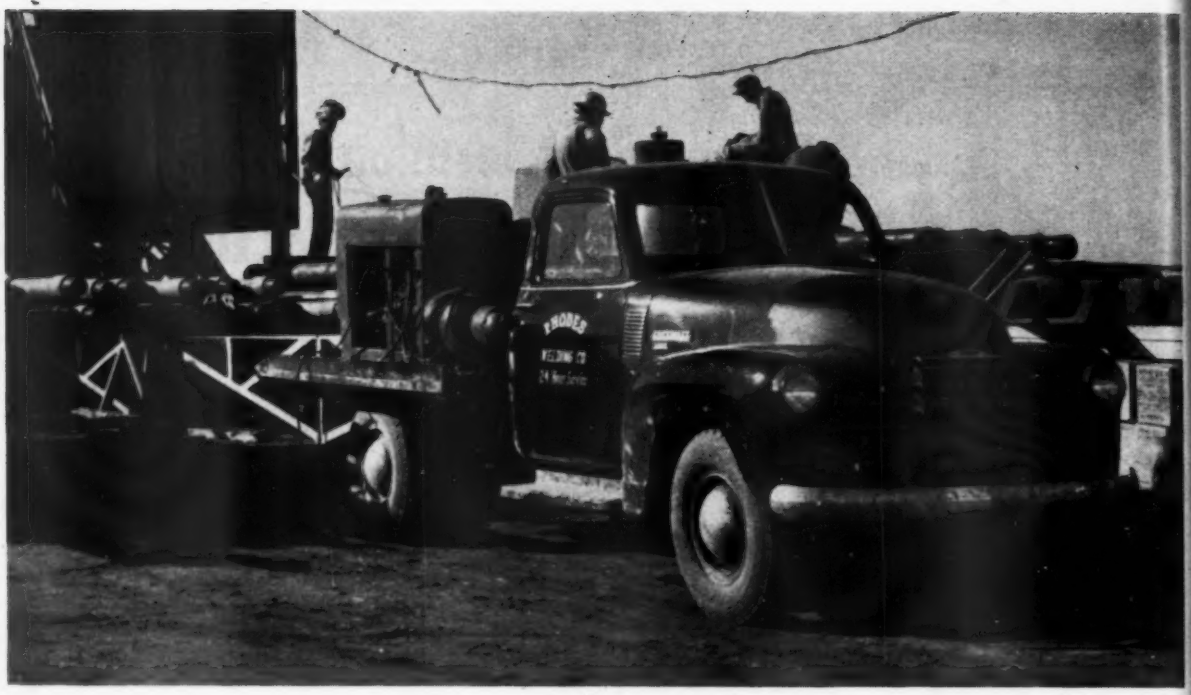
Even for your simple installations, you'll save money in the long run by employing Foxboro Meters. Write for Bulletin 351-2 describing these extra-values. **The Foxboro Company, 60 Neponset Avenue, Foxboro, Mass., U. S. A.** Branches in 32 U. S. cities—also 6 Canadian cities.



EXCLUSIVE FOXBORO REFINEMENTS

- Segmental Lever Transmission gives *truly* straight-line calibration.
- Extra-large Float with long travel gives extra power.
- Sure-Seal Check Valves, submerged in mercury, positively prevent mercury losses from overrange.
- Pressur-Tite Frictionless Bearing eliminates stuffing box and packing.

FOXBORO REG. U. S. PAT. OFF. **DIFFERENTIAL-TYPE FLOW METERS**



Your money goes farther . . . your work goes faster!

These are the famous Advance-Design features that help make

CHEVROLET TRUCKS AMERICA'S FIRST CHOICE!

TWO GREAT VALVE-IN-HEAD ENGINES: the 105-h.p. Loadmaster or the improved 92-h.p. Thriftmaster—to give you greater power per gallon, lower cost per load • POWER-JET CARBURETOR—smoother, quicker acceleration response • DIAPHRAGM SPRING CLUTCH for easy-action engagement • SYNCHRO-MESH TRANSMISSIONS for fast, smooth shifting • HYPOID REAR AXLES—for dependability and long life • DOUBLE-ARTICULATED BRAKES—for complete driver control • WIDE-BASE WHEELS for increased tire mileage • BALL-TYPE STEERING for easier handling • UNIT-DESIGN BODIES—for greater load protection • ADVANCE-DESIGN STYLING —for increased comfort and modern appearance.

You're money ahead with Chevrolet trucks, for Chevrolet is the lowest priced line of all—and offers exceptional savings in on-the-job operating cost and in cost of maintenance, too.

And, you're money ahead with Chevrolet's special features. Chevrolet features like Valve-in-Head engine, Power-Jet carburetor and many others exclusive in the field.

You're money ahead because Chevrolet has a model built for your job . . . a truck engineered to the special requirements of that job and built to do it faster, better, more efficiently.

Yes, your money goes farther . . . your work goes faster with Chevrolet trucks. Let your dealer tell you all the details. Let him *prove* that *you're money ahead* with Chevrolet.

CHEVROLET MOTOR DIVISION, *General Motors Corporation*
DETROIT 2, MICHIGAN

CHEVROLET

First in demand
First in value
First in sales

CHEVROLET *ADVANCE-DESIGN* TRUCKS

XUM

Thanks
Let us give thanks for our American system of Free Enterprise, Individual Initiative and Universal Freedom! May we defend and preserve our heritage.
Uncle Sandy
THE UNITED SUPPLY MAN
Courtesy
Service
Dependability
UNITED SUPPLY
AND Manufacturing COMPANY
TULSA, OKLAHOMA
Stores in Kansas, Oklahoma, Texas, Louisiana, and New Mexico

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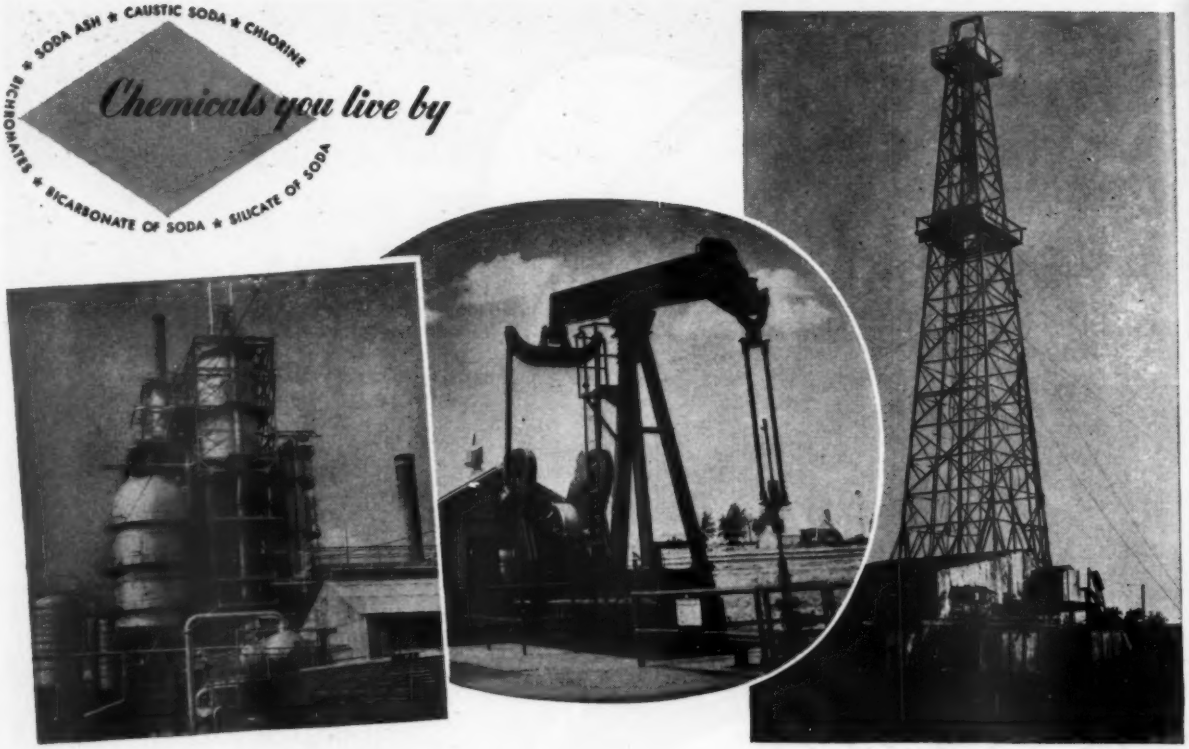
★ SODA ASH ★ CAUSTIC SODA ★ CHLORINE
★ BICHROMATES ★ BICARBONATE OF SODA ★ SILICATE OF SODA

Chemicals you live by



One tax on this piping YOU CAN DUCK...

Corrosion takes a continual toll on your profit, just like your taxes. But unlike taxes, you can do something about it. Research by DIAMOND ALKALI is proving the effectiveness of chromate chemicals as corrosion inhibitors—in drilling equipment, in producing wells, in refineries.

For example, in producing wells chromate chemicals are helping to reduce the corrosive effect of the effluent to a minimum. Added to drilling fluids, they are lengthening the life of drill strings. In cooling systems of Diesel engines, in pumping systems, in fact, almost everywhere that water circulates, chromates are checking corrosion.

It will pay you to investigate the progress made in the application of these chemicals. There's a DIAMOND salesman near you. Why not call him today?

DIAMOND SALES OFFICES: Boston, New York Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis and Houston. Also representatives in other principal cities.

DIAMOND CHEMICALS FOR THE OIL INDUSTRY

DIAMOND ALKALI COMPANY • CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS

They Say—

Letter from Korea

Capt. Ted A. Armstrong, on military leave from his duties as district editor of The Oil and Gas Journal since August, is now on duty in North Korea with the First Marines. Following are extracts from his first letter to his associates on the Journal's editorial staff:

"We docked in Yokohama on Friday and 2 hours later, at 11:16 a.m., 35 of the officers were on a bus headed for Haneda field in Tokyo. We climbed on a DC-4 there and landed in Korea about 5:30. We spent the night in Ascom City on the floor of an abandoned barracks, rode a truck to Inchon the next morning, and went aboard ship there with the First Division. The division was loading for an assault on Wonsan, but before we got out of the harbor the ROK's took it from the rear, and saved us from what would probably have been the bloodiest assault of the war. We cruised up and down the coast for days and days—they postponed the landing in order to remove 1,000 submerged mines from the harbor and 3,000 land mines from the beaches, and finally landed here quite peacefully October 26.

"There still are a few gooks in the hills around here. One of our drivers got creased yesterday. And, just as unpleasant, there are several on the ridge around our camp whose spirits have joined their ancestors but whose physical beings were not interred.

"Wished yesterday I had had some film, which I wasn't able to get before coming over here. I passed the Wonsan refinery and could really have picked up a picture for you. That place looks as if it had been bombed, shelled, burned, and strafed and then the rubble pushed back and forth with a fleet of bulldozers. There is absolutely nothing there now which could ever be used again—it's beyond rehabilitation.

"Much of the city is in a like fix, with areas several blocks in each d i r e c t i o n completely leveled. Of course, from my view, the Koreans didn't lose much, but on the other hand, it's all they had. This is the most poverty-stricken place I've ever seen—including Nicaragua.

"One has to keep in mind the overall picture and the 'threat to democracy' or be caught wondering how so many men from the United States happen to be over here.

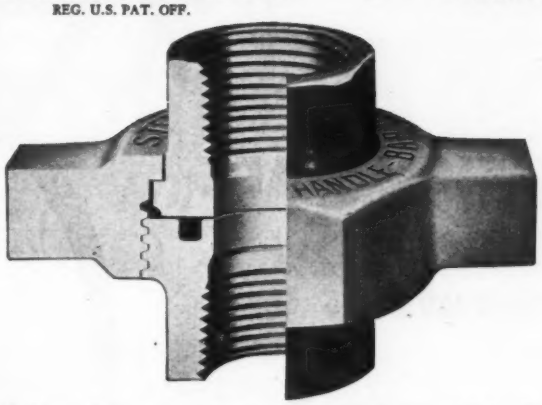
"This country is similar to Oklahoma in some respects—mostly vege-

IT'S REGAL

HANDLE-BAR "O" RING, a Member of The Royal Family of PETRO, HYDRO, and MARK A.A.R. Forged Steel Unions

HANDLE-BAR "O" RING

REG. U.S. PAT. OFF.

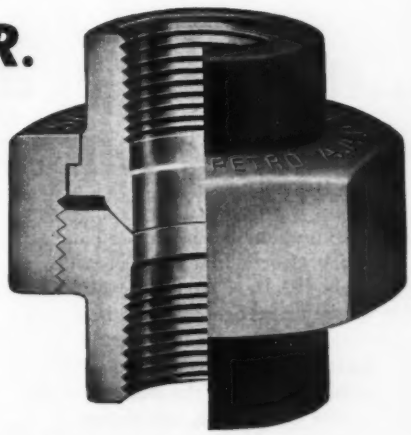


Hand tighten the nut and the pressure from within the line makes the seal with the "O" Ring between the two mating surfaces. The one and only sealing method that does not require brute force to make a tight joint on pressures to 3000 lbs. C.W.P., and temperatures to 212° F. Write for bulletin "O" Ring HB.

PETRO A.A.R.

REG. U. S. PAT. OFF.

"PETRO", the Prince of forged steel unions; faithful, trustworthy, and obedient to its sovereign owner. Permanently lubricated nut threads, cold rolled female seat. Pressures to 3000 lbs. Temperatures to 1000° F.



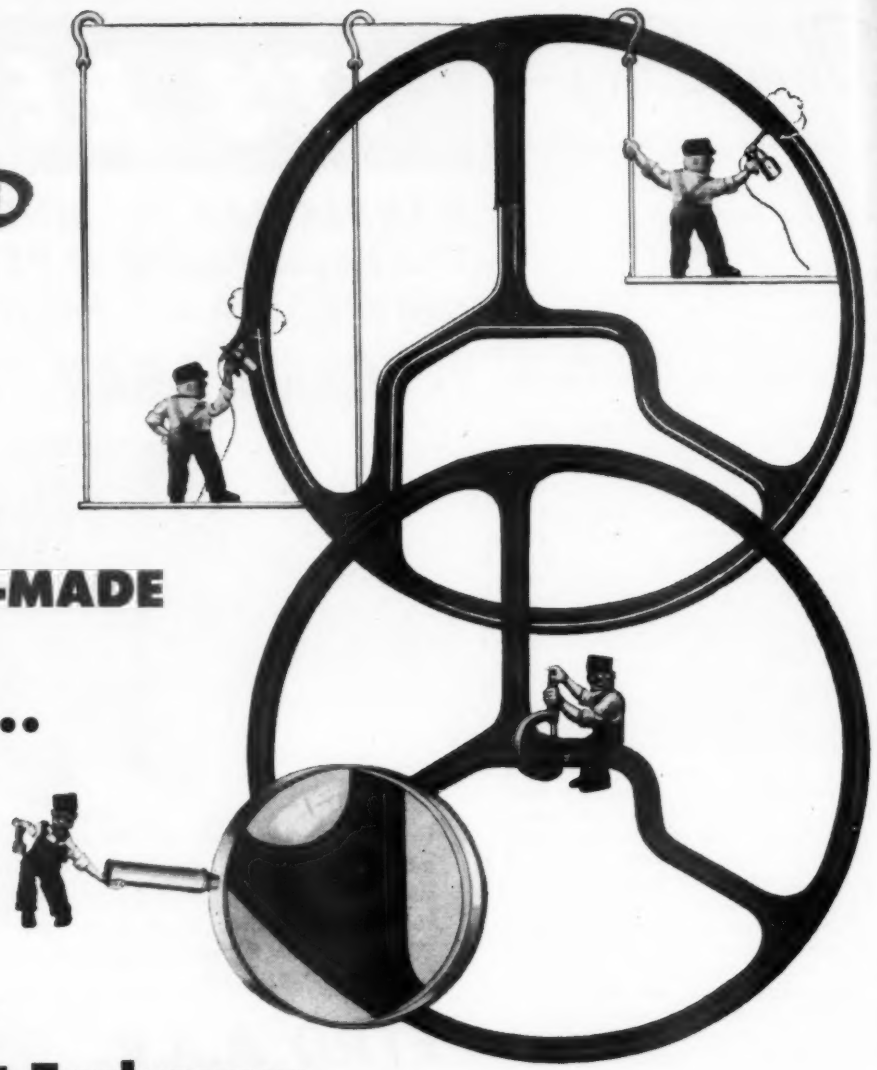
Write Dept. G for illustrated catalog or refer to listings in Composite Catalog pages 3082-3083, Chemical Engineering Catalog pages 980-981 and Refinery Catalog page 546.

ORDER BY TRADE NAME FROM YOUR LOCAL SUPPLY STORE

ORIGINATORS AND PIONEERS OF STEEL UNIONS SINCE 1912

CLAYTON MARK & COMPANY

1900 DEMPSTER STREET • EVANSTON, ILLINOIS



PAINTED to resist rust...

PRECISION-MADE to resist blowouts...

...this Heat Exchanger Gasket will stay on the job longer

The durable coating of red paint on every Goetze iron or steel-jacketed Style 923 Heat Exchanger Gasket is a sure "stop light" against rust. And rust, as every metal gasket user knows, is a primary cause of deterioration—both in the storehouse and on the job awaiting installation.

Equally important in the fabrication of Style 923 is the precision craftsmanship which eliminates cracks and wrinkles in the metal jacket—defects which can rapidly lead to leaks and blowouts.

"Custom tailoring" accounts for the meticulous care which is taken in the forming of every one of these gaskets... care which results in a long, efficient service life. You can always depend on a Goetze Style 923 to fit and seal perfectly... to stay on the job without leaks or blowouts. And that, of course, pays off in less down time and fewer gasket replacements.

Find out how little it costs to have Goetze Heat Exchanger Gaskets "tailored" to the size and shape *you* need. For prompt estimates and recommendations, write Johns-Manville, Box 290, New York 16, N. Y.

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tation and the nature of the climate—but is far more rugged. From the air (we flew along a line from Pohang to Seoul) there's little to be seen except one ridge after another, with cultivated valleys and small villages scattered here and there. It is easy to see where 'No Name Ridge' got its monicker and why the battle there was so fierce."

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"Ideas such as competition, equal rights and opportunity, freedom of speech and conscience, and private enterprise are the stout, enduring sinews of America. By protecting those ideas we protect America. That is why I would like to express this concluding thought: Let us never weaken in our resolve to defend our ideas against every adversary, for in these ideas reside the spirit of our past, the strength of our present, and the promise of our future."

Robert G. Dunlop, president of Sun Oil Co., before the Philadelphia Rotary Club.

CALENDAR

November

Petroleum Electric Power Association, Twenty-second Anniversary meeting, Arlington Hotel, Hot Springs, Ark., November 27-28.

American Society of Mechanical Engineers, annual meeting, Hotel Statler, New York City, November 26-December 1.

Rocky Mountain Oil and Gas Association, annual meeting, Denver, November 30-December 1.

Southwestern Geophysical and Geological Conference, Hotel Texas, Fort Worth, November 30-December 2.

December

American Institute of Mining and Metallurgical Engineers, annual joint meeting, Texas sections, Texas Technological College, Lubbock, Tex., December 1-2.

American Institute of Chemical Engineers, annual meeting, Columbus, Ohio, December 3-5.

New York Oil Heating Association, Hotel Statler, New York City, December 4.

Oil Industry TBA Group, 1950 meeting, Edgewater Beach Hotel, Chicago, December 4-5.

New Mexico Oil and Gas Association, annual meeting, La Fonda Hotel, Santa Fe, December 6.

Natural Gasoline Association of America, Herring Hotel, Amarillo, December 8.

Interstate Oil Compact Commission, winter meeting, Shamrock Hotel, Houston, December 11-13.

1951

January

American Gas Association, home-service workshop, Hotel Statler, Washington, D. C., January 3-5.

Kansas Oil Men's Association, annual convention, Lassen Hotel, Wichita, January 8-9.

American Institute of Electrical Engineers, Tulsa Section, meeting on explosion-proof motors, Michaelis Cafeteria, January 11.

Society of Automotive Engineers, annual meeting and engineering display, Hotel Book-Cadillac, Detroit, January 8-12.

Southwestern Legal Foundation, second annual institute on oil and gas law and taxation, Southwestern Legal Center, Dallas, January 18-20.

Compressed Gas Association, annual meeting, Waldorf-Astoria Hotel, New York City, January 22-23.

Northwest Petroleum Association, annual convention, Nicollet Hotel, Minneapolis, January 25-26.

Southern Gas Association, employe-relations section and accident-prevention round tables, Mobile, Ala., January 26.

Instrument Society of America, New York section, Hotel New Yorker, New York City, January 26-27.

February

American Institute of Electrical Engineers, Tulsa Section, meeting on explosion-proof electrical equipment, Michaelis Cafeteria, February 8.

American Institute of Mining and Metallurgical Engineers, annual meeting, Jefferson and Statler hotels, St. Louis, February 19-22.

Kentucky Petroleum Marketers Association, annual meeting and trade show, Brown Hotel, Louisville, February 20-21.

Iowa Independent Oil Jobbers' Association, Inc., annual convention, Hotel Fort Des Moines, Des Moines, February 21-22.

Wisconsin Petroleum Association, annual convention and equipment show, Milwaukee Auditorium, Milwaukee, February 27-28.

March

American Society for Testing Materials,

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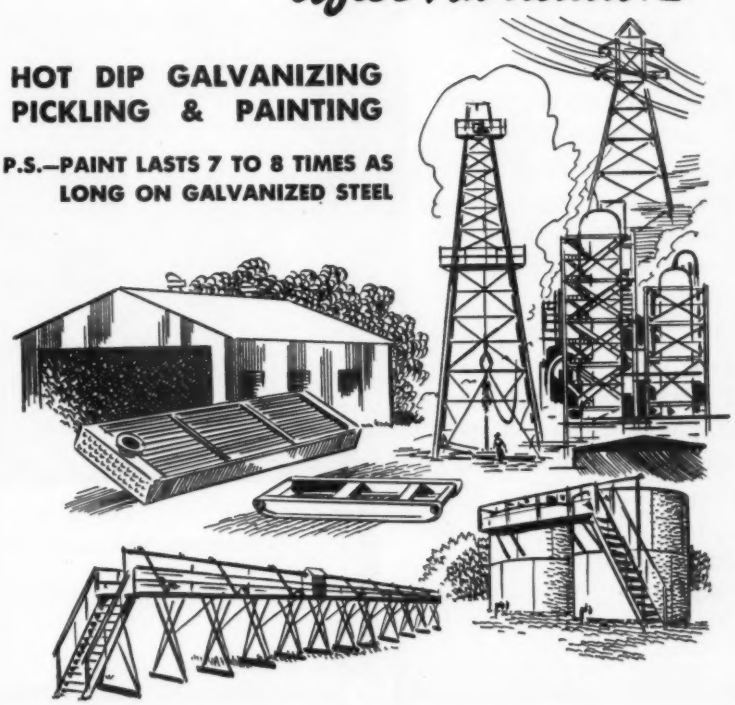

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spring meeting and committee week, Cincinnati, March 5-9.

American Petroleum Institute, division of production, southwestern district meeting, Hotel Beaumont, Beaumont, Tex., March 7-9.

Indiana Independent Petroleum Association, spring convention and refiners and suppliers exhibit, Hotel Severin, Indianapolis, March 8-9.

Mid-West Gas Association, Hotel Fontenelle, Omaha, March 12-14.

Illinois Petroleum Marketers Association, annual convention, Sherman Hotel, Chicago, March 13-15.

National Association of Corrosion Engineers, annual conference and exhibition, Statler Hotel, New York City, March 13-17.

Gas Appliance Manufacturers Association, annual meeting, The Homestead, Hot Springs, Va., March 19-21.

Ohio Petroleum Marketers Association, annual convention and marketing exposition, Deshler-Wallick Hotel, Columbus, Ohio, March 20-22.

American Petroleum Institute, division of production, Mid-Continent district spring meeting, Herring Hotel, Amarillo, March 21-23.

Texas Independent Producers and Royalty Owners Association, fifth annual meeting, Beaumont, Tex., March 27-28.

New England Gas Association, annual meeting, Hotel Statler, Boston, March 29-30.

April

American Gas Association, industrial and commercial gas section, conference on industrial and commercial gas, Shoreham Hotel, Washington, D. C., April 2-4.

American Society of Mechanical Engineers, spring meeting, Atlanta, April 2-5.

Instrument Society of America, New Jersey section, Essex House, Newark, N. J., April 3.

American Petroleum Institute, division of production, Eastern district meeting, Deshler-Wallick Hotel, Columbus, Ohio, April 3-5.

Mid-West Regional Gas Sales Conference, Edgewater Beach Hotel, Chicago, April 9-11.

Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, April 10-12.

American Gas Association, distribution, motor vehicle, and corrosion conference, Hotel Peabody, Memphis, April 16-18.

American Society of Lubrication Engineers, annual convention and lubrication show, Bellevue-Stratford Hotel, Philadelphia, April 16-18.

National Petroleum Association, Hotel Cleveland, Cleveland, April 18-20.

American Petroleum Institute, Rocky Mountain district spring meeting, Gladstone Hotel, Casper, Wyo., April 19-20.

Southern Gas Association, Buena Vista and Edgewater Gulf hotels, Biloxi, Miss., April 23-25.

Natural Gasoline Association of America, annual convention, Mayo Hotel, Tulsa, April 25-27.

Indiana Gas Association, French Lick Springs Hotel, French Lick, Ind., April 26-27.

American Gas Association, industrial and commercial gas section, industrial gas school, William Penn Hotel, Pittsburgh, April 29-May 4.

American Geophysical Union, thirty-second annual meeting, National Academy of Sciences, Washington, D. C., April 30-May 2.

American Petroleum Institute, division of refining, sixteenth mid-year meeting, Mayo Hotel, Tulsa, April 30-May 3.

May

Liquefied Petroleum Gas Association, annual convention and trade show, Stevens Hotel, Chicago, May 6-9.

Gas Appliance Manufacturers Association, natural-gas department spring meeting, Dallas, May 7-9.

American Petroleum Institute, division of production, Pacific Coast district, spring meeting, Biltmore Hotel, Los Angeles, May 10-11.

American Institute of Chemical Engineers, regional meeting, Hotel Muehlebach, Kansas City, May 13-16.

American Gas Association, operating section, production and chemical conference, Hotel New Yorker, New York City, May 14-16.

Pennsylvania Gas Association, Wernersville, Pa., May 15-17.

American Petroleum Institute, division of marketing, mid-year meeting, Cincinnati, May 28-29.

Third World Petroleum Congress, Kurhaus, Scheveningen, the Netherlands, May 28-June 6.

American Petroleum Institute, standardization and standing committees, division of production, mid-year meeting, Brown Palace Hotel, Denver, May 28-June 1.

June

American Society of Mechanical Engineers, semiannual meeting, Toronto, Ont., Canada, June 11-15.

Canadian Gas Association, Bigwin Inn, Lake of Bays, Ont., Canada, June 16-20.

American Society for Testing Materials, annual meeting, Atlantic City, N. J., June 18-22.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas-Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month. Ye Olde College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads, annual Christmas dance, December 9, Hotel Pierre.

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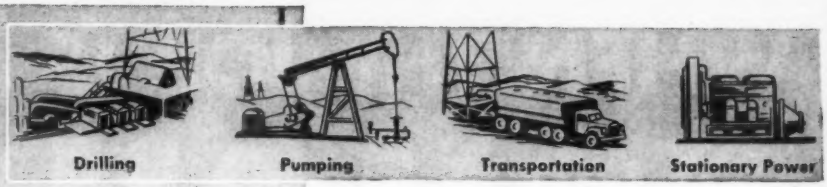

WHEN YOU CHOOSE AN ENGINE

When you choose an engine for a job in the oil fields, note particularly the type of engine most commonly used. If it's on a pumping or servicing rig, chances are you'll find a gas engine because more gas engines are at work in oil fields today than all other types combined.

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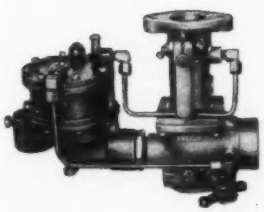

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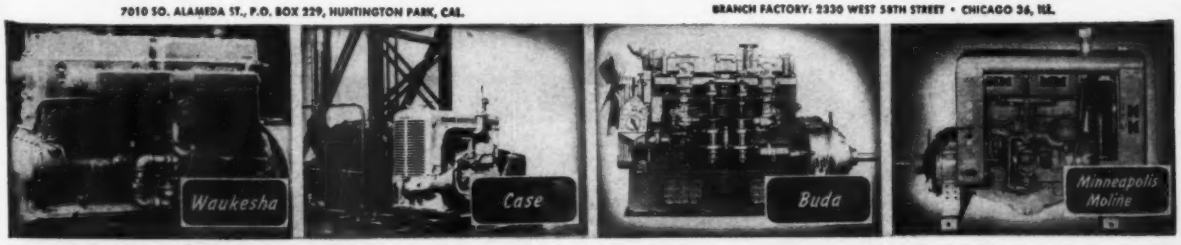

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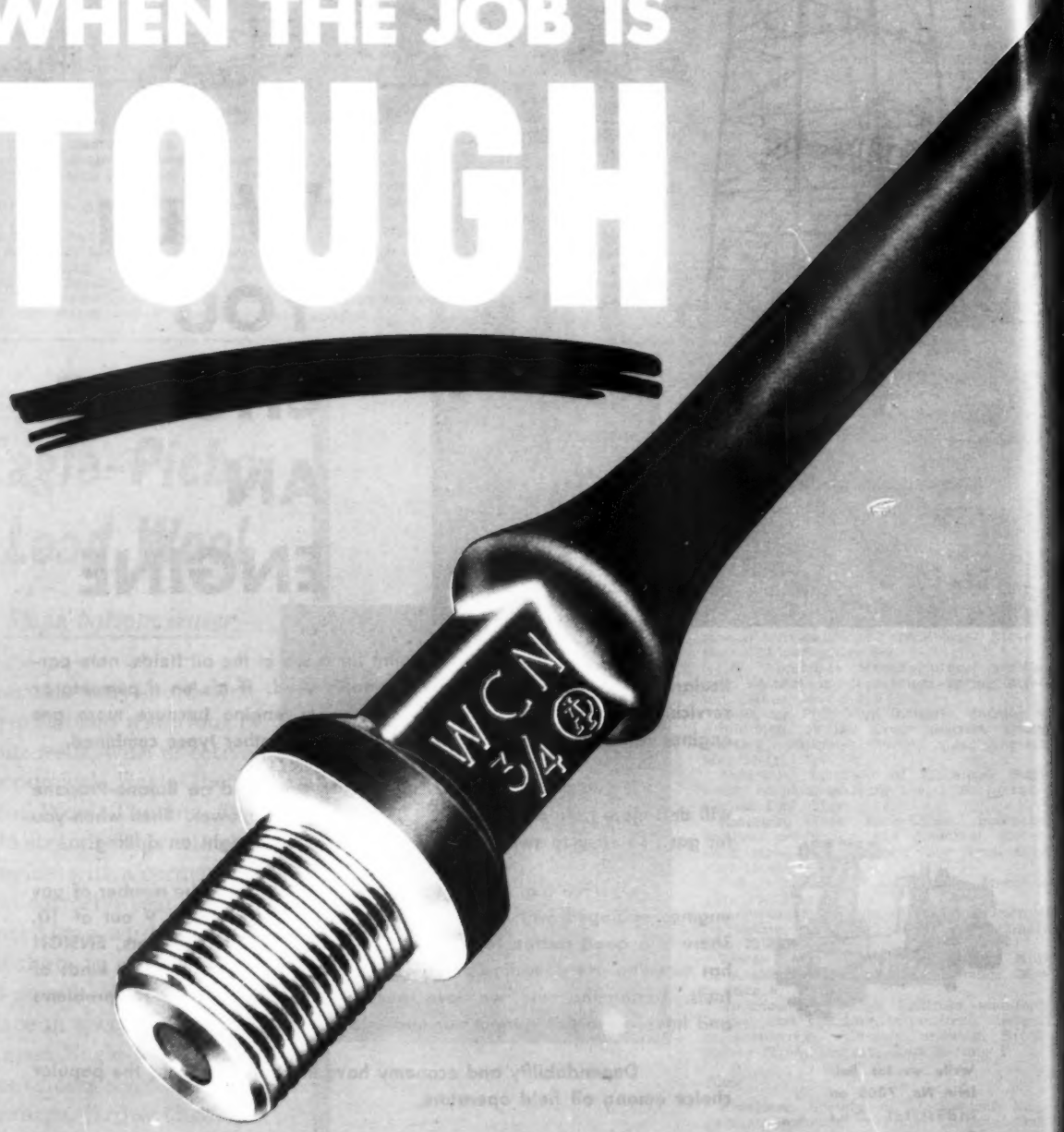

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JOURNALLY Speaking

Tankerman's Tales

THE genial-looking hombres in the picture on this page might easily be taken for a couple of Caribbean pirates or rum runners plotting their next nefarious expedition. The picture *was* taken on a ship in the Caribbean, but everything was legal and aboveboard.

The vessel is the S.S. Albert E. Watts, a 16,928-ton tanker in the Sinclair fleet. The guy without a shirt is her master, Capt. R. Fisch. The handsome young man is none other than our Dahl M. Duff, the Journal's International Editor. The grins are occasioned by some of the skipper's innumerable sea stories. We asked Dahl to relay a couple of these Fisch stories for our readers, but he replied something to the effect that the captain's salty adjectives were not entirely appropriate for a family journal, so we are as much in the dark as you are as to what was so funny when the picture was snapped.

Dahl was on his way to Venezuela to participate in the opening of Sinclair's new refinery there, all of which he has duly and well reported in our favorite oil publication. Dahl writes oil news about the entire world but the bulk of his traveling takes place on Manhattan Island. He gathers his vast and varied volume of dope in mysterious ways known only to himself but which include interviews with oil men having international intelligence located in or passing through New York, plus indefatigable telephoning, cabling, and correspondence with "string men" and contacts he has built up all over the world.

There's not much that goes on in the world of oil which escapes the eagle eye of our Mr. Duff, but this process keeps him pretty well glued to his desk. So we are running this picture to prove that our boys do get around some. Join the Journal and see the world. But if you can't do that, read the Journal and keep up with the world. But the next time we get Dahl off in a corner for a short beer we're going to ask him to tell us some of his tankerman's tales.

Westward, Ho

EVERY oil field is different, but the California oil fields, naturally, are the differentest of all. For example, there is the Long Beach tidelands field, which was toured by many A.P.I. delegates.

The city of Long Beach owns the offshore oil rights, but all profits must go into harbor development. So the city drilled along the beach, slanting the wells out under the Pacific Ocean. The proceeds were used to fill in more land to make piers, shipping terminals, and breakwaters, and each one is lined with wells spaced 10 or 12 ft. apart but bottomed far out at sea. This produced more oil which financed more piers which gave places for more wells.

Unless the Supreme Court stops it, there would seem to be no end to this process of building more piers to drill more wells to build more piers to drill more wells, and so ad infinitum. Ever since the Drake well, the oil industry has been joshing about drilling to China, but Long Beach is well on its way to do just that.

Liquid Sunshine

AS usual, southern California trotted out some "unusual" weather for the A.P.I. meeting. The first day of the convention it rained steadily all day. With characteristic optimism the natives claimed they were glad of it, explaining that so far this year they have had 17 in. of sunshine but only 1 in. of rain and the crops needed the moisture, but they acted a bit embarrassed about it nevertheless.

—Henry D. Ralph

XUM

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the OIL AND GAS JOURNAL

November 23, 1950

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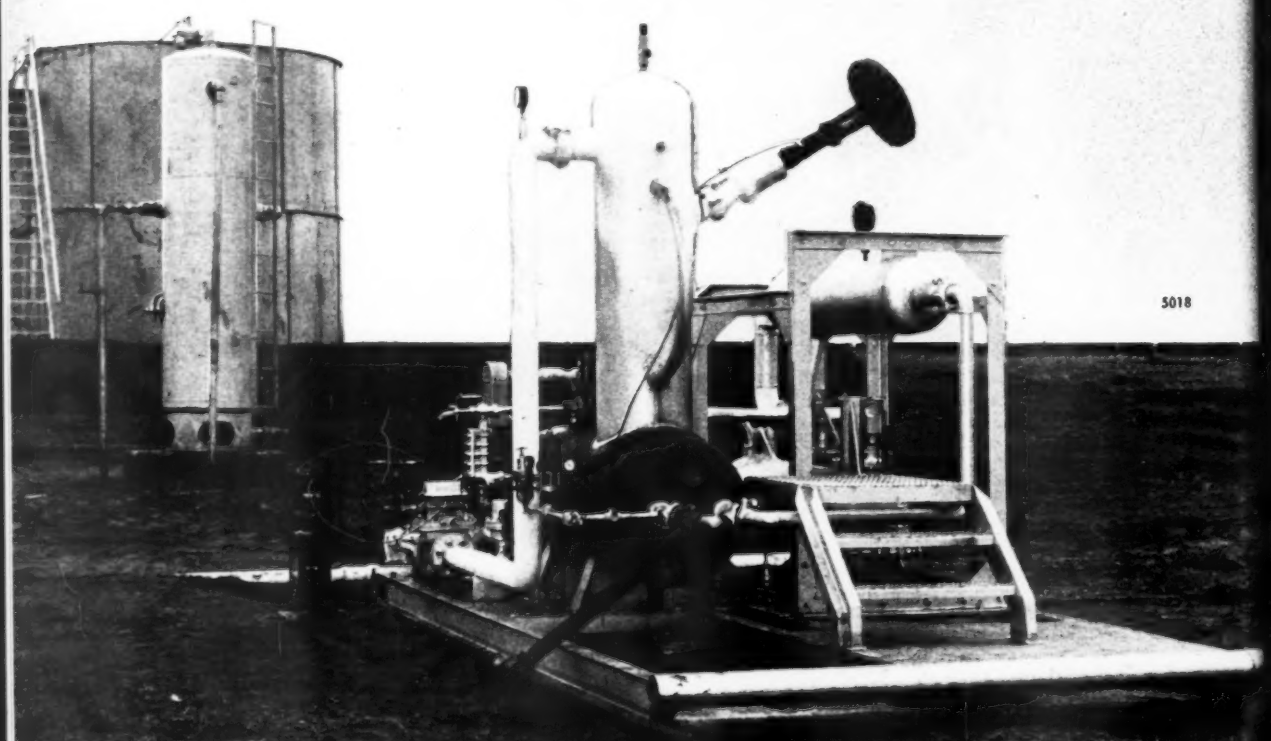

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Timely Inspiration

One event at the Los Angeles meeting of the American Petroleum Institute brought the delegates to their feet with ringing applause and was the subject of corridor discussion throughout the meeting.

It was not a report of some achievement in the oil industry, not a news announcement, not a political triumph. It was an address by Bernard L. Majewski, vice president of Deep Rock Oil Corp. And it was not the part of his address dealing with oil which fired his listeners, but that part in which he left his assigned subject to discuss the danger of communism and what can be done about it.

Now opposition to communism and support of the American way of life is assumed, and rightly, to be universal in the oil industry. Oil men have been making speeches on this subject for years. Several of them, in fact, were on this same A.P.I. program. What made Majewski's speech outstanding was that he cast aside the customary pussyfooting and weasel words and made a two-fisted, old-fashioned appeal to fight for God and country.

It was an inspirational address from a forum not prone to emotionalism. But the way it was received showed that it was entirely appropriate, and that it carried a welcome and needed message.

He denounced the "God-hating communists and their sympathizers" as the embodiment of the forces of evil on earth, and he called for a dedication to Christian principles and democratic ideals to fight and overcome this monstrous evil, crying that our country is not immortal and is in real danger.

Not so many years ago it was considered "smart" to tolerate, even to encourage, leftism. Those who talked about the enemy within our gates were branded as witch hunters. The trend toward totalitarianism was accepted as social progress. Only a few die-hards fought a rear-guard action.

Then the truth gradually dawned that there is no compromise with communism, that communism is, indeed, bent on exterminating everything for which this country has stood. Not just the profit system is at stake, but home and motherhood and liberty and the Bill of Rights and the Beatitudes.

This kind of talk may sound like flag waving and Bible thumping, but Majewski's reception shows that it is the sort of inspirational message needed at this time. Luncheon speeches, newspaper advertising, billboards, and editorials in favor of free enterprise are all right in their way, but they are no substitute for the individual fervor which Majewski asked.

The oil industry, which prides itself on being the outstanding example and exponent of free enterprise, has done a good job of reasoning, argument, and factual exposition. But it has shied away from inspiration in all its efforts to combat the advance forces of communism. Majewski had the courage to speak from his heart. Since it has become obvious that defense of free enterprise means all-out war on communism in all its aspects, this type of inspiration from industry leaders is indeed timely.

XUM

THIS WEEK

CONTROLS—Present priorities system showing signs of breakdown. . . . Complete government control of distribution, use of basic materials will be in full effect by middle of next year, marking return of Controlled Materials Plan used during last war. . . . ¶PAD and NPA reach agreement on former's activity scope, but authority over foreign-oil operations still not settled. . . . ¶A.G.A.'s efforts to obtain separate control agency for natural-gas industry appears futile. . . .

STEEL—There should be enough oil-country tubular goods if inventories are kept to a minimum, but some pipe-line, other oil projects may be curtailed due to lack of steel, U. S. Steel president tells A.P.I. . . . Price raise inevitable if fifth round of wage increases hits steel industry. . . . ¶Texas Railroad Commission adopts new stage-cementing order as an aid in conserving steel. . . . ¶P.E.S.A. discusses steel-allocation for equipment manufacturers. . . .

INDUSTRY—Bureau of Labor Statistics predicts that substantial jobs will be available for new workers in oil production and refining during next 5 to 10 years. . . . ¶Shell orders two of largest Platforming units for Wood River, Houston refineries. . . . ¶A.P.I. reelects Frank Porter president for 1951. . . . ¶New thread compounds for use on casing and tubing to be put in service on trial basis. . . . ¶More than 25 oil companies engaged in some phase of petrochemical industry. . . . ¶Houston oil companies try new public-relations method in observing Business-Industry-Education Day. . . .

PRODUCTION—World crude output exceeded 11,000,000 bbl. daily in September. . . . ¶Investment of $15,000,000 by three companies will increase return from Worland oil field by $2,500,000 yearly. . . . ¶Texas Railroad Commission reduces allowable by 160,083 bbl. daily for December. . . . Imports attacked by operators during hearing for first time since start of Korean war. . . . ¶New extensions to Mustang Island field in Corpus Christi Bay holding attention of South Texas operators. . . . ¶Coalinga Nose Unit in California to be in full operation by first of next year. . . . ¶California Supreme Court declares state's well-spacing law is constitutional. . . .

TRENDS—Major product stocks increased 13,646,000 bbl. in the 5-week period ended November 11 compared with an increase of 7,566,000 bbl. in same period of 1949. . . . Stocks leveled off and started down early in November last year. . . . ¶For the 2-week period ended November 11 of this year, major product production exceeded demand by 300,000 bbl. daily. . . .

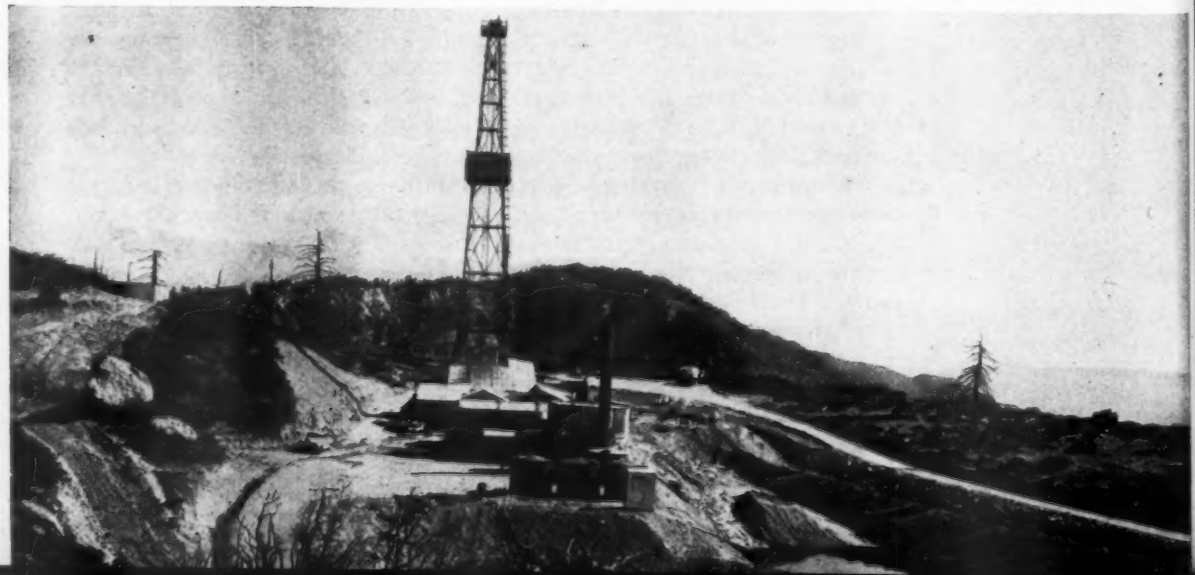
ACTIVITY—Crude production for week ended November 18 averaged 5,817,050 bbl. daily, down 17,775 bbl. daily from previous week. . . . ¶Total completions decreased 28 wells to 885 for the week. . . . Wildcat completions increased 5 wells to 184. . . . ¶Rotary rigs operating in United States set a new record with 2,391 rigs on November 13. . . .

EXPLORATION—More than 12,000,000 acres now under lease in North Dakota, with attention centering in Williston basin. . . . Dry wildcat in Medicine Buttes area gives valuable geological information. . . . ¶Combined geophysical groups plan regional meeting in Fort Worth to discuss oil potentialities of Southwest areas. . . .

CANADA—First crude from Alberta fields crosses International boundary via Interprovincial's pipe line en route to Superior, Wis., terminal of Lakehead Pipe Line Co. . . . ¶Imperial reduces prices of gasoline and kerosine following opening of Interprovincial line. . . . ¶Geophysical activity in western Canada continuing at high level.

INTERNATIONAL—Work under way on Conselho Nacional do Petroleo refinery in Brazil. . . . ¶Pemex negotiating to buy remaining stock of Mexican Gulf Oil Co.

READY FOR WINTER.—On a mountain top in the Coastal range of California, at an elevation of about 6,800 ft., Standard Oil Co. of California recently started this remote wildcat, 1 Hattie Russell. To gain access to the chosen site, Reyes Peak in Ventura County, Standard first had to construct a 9-mile all-weather road at a cost of $80,000. As the temperature this winter is expected to reach 10° below zero, the rig was completely enclosed. Water for the operation has to be pumped 4 miles up hill. Spudded on October 2 and slated to drill to about 10,000 ft., hole had been drilled to about 1,960 ft. at last reports.



Tightening Controls

Complete government control of distribution, use of basic materials will be in full effect by mid-1951

Bertram F. Linz

WASHINGTON. — With the present priorities system already showing signs of strain and threatening to break down entirely within the next few months, complete government control of the distribution and use of many basic materials will be in full effect by the middle of next year, National Production Authority officials disclosed last week.

This return to the Controlled Materials Plan which was used during the last war, officials explained, will be necessary to support the many military programs and those contributing to defense which are now being worked out. The present priorities system, designed principally to get the military program under way and on schedule, it was pointed out, will tend to fall of its own weight as more and more ratings are issued against diminishing supplies of materials and eventually a priority will become merely a hunting license.

Pending the development of the new system, which will require time and the building up of a large organization, the NPA will use directives to assure materials for programs essential to defense, as in the case of the recent orders setting aside steel for freight and tank-car construction and for warehouses. Additional programs which will require directives are now being set up, among them one for refining construction.

Forecast.—The forecast that a CMP will be set up by next summer is based on the expectation that Congress will appropriate between $50 and $60 billion for the military next year and defense production will be moving along at a high rate, raising conditions approaching those of World War II.

Direct allocations are now being talked of in terms of steel, copper, and aluminum, but it is probable that by midsummer other basic materials also will feel the pinch of armament production and be added to the list.

In the interim, the Government can keep the economy fairly stable by setting up a system of comparative ratings, now under consideration, which would assign top priority to goods needed by the military, the next highest for maintenance, repair and operating supplies for industry, the third for refineries and power, and so on, to which can be coupled limitation orders prohibiting the use of specified materials for nonessential civilian goods.

Basic reason.—The basic reason for full government control of materials is more than the necessity to divide the available supply to the best advantage. It is not sufficient to say that the industry will need a certain amount of steel, a given tonnage of copper, or so many thousand pounds of aluminum. The NPA must be able to tell the producers of steel how many tons of a particular kind and particular shape is necessary and, equally important, when and where it must be scheduled for delivery.

A definite indication of the shortcomings of the method now being followed to cut up the steel supply came from the steel industry itself last week in a warning that the NPA order requiring that warehouses be given proportionate percentages of products based on average shipments during the first 9 months of this year may not provide as much steel as they got this year.

During the January-September period, it was explained, warehouses received about 20 per cent of all steel shipped, but the 20 per cent provided for by NPA is to come after defense and essential priorities have been met which will mean considerably less than 20 per cent of shipments. Warehouses, however, are expected to do better in tubular goods than in such things as flat-rolled products of which approximately 50 per cent will be set aside for defense and essential priorities by next June.

During the week, the NPA issued several orders which are seen as having some effect upon the oil industry.

Inventory control.—An interpretation of the inventory-control regulation requires that in cases where deliveries of goods covered by outstanding orders would result in a purchaser exceeding his "practical minimum working inventory," such orders must be promptly canceled, reduced, or deferred to the extent necessary to meet the requirements of the regulation, but leaves buyer and seller free to negotiate the method to be adopted.

The interpretation also explained that the inventory exemption for imported materials extends to persons who contract for the material prior to landing, even though they buy from or through a broker, wholesaler or other importer who makes the customs entry in his own name and retains title until shipment is made to final destination. If the broker or importer takes the material into his own inventory, however, any person to whom he later delivers it is subject to the regulation.

A new order cut civilian consumption of aluminum by 35 per cent effective January 1, and new rules cut the permissible inventory of tin and alloys and materials containing tin, including babbitt metal and solder.

Tax hearings. — At the Capitol, the House ways and means committee opened hearings on the excess profits tax, receiving a recommendation from Treasury Secretary John W. Snyder that the rate be set at 75 per cent with adequate provision for the protection of small corporations. Even as the hearings opened, however, Republican members made it clear they would not go along with the administration in its drive to have the bill enacted this year.

A newspaper story that the Petroleum Administration for Defense was considering imposition of a ceiling on the octane content of automotive gasoline as a move to save tetraethyl lead brought quick denial from PAD officials who said no such action was even contemplated at the present time.

A lack of concern among PAD officials over the lead situation gave the impression it is satisfactory at the moment with no indications it will deteriorate in the near future.

Benzene Quandary

Lack of firm commitment for product stalls plans

WASHINGTON. — Inability to secure a firm commitment from the chemical industry to take its output over a period of 5 years or so appears this week to be the major stumbling block to quick development of badly needed additional supplies of benzene by the oil industry.

In an effort to cut the knot a move is under way in the National Production Authority to get producers and consumers together for a conference, possibly before the end of the month. Plans for the meeting contemplate not only participation by the petroleum refiners and chemical companies but representatives also of the coal and coke industries, the Oil and Gas Division, Bureau of Mines, Defense Department, and NPA.

Although the original idea was to secure the construction of new plants to produce benzene from either coal or oil it is indicated now that additional supplies are most likely to be developed through facilities developed by individual oil companies.

XUM

More than a half-dozen companies are said to be ready to go ahead with construction programs if assured they are not aiming at a purely temporary market, among those mentioned publicly being Pan-American Refining Corp., Shell Oil Co., Universal Oil Products Co., and Standard Oil Co. (Ind.), which have expressed interest in building facilities for production of benzene by Platforming or hydroforming.

Proposal rejected. — The companies, however, are understood to have turned down proposals for joint action for the construction of specialized plants to "skim" benzene off of benzene-bearing crudes and to have expressed a preference for manufacturing it from crudes suitable for the purpose as part of the regular refining process.

The proposal to build plants for the production of benzene from coal appears to have lost all momentum as a result of the action of the Muitions Board in tossing the problem back to the Petroleum Administration for Defense where it was sent to the military petroleum advisory committee for study and a report which may be available around the turn of the year.

This proposal involved the construction of two plants which would cost in the neighborhood of $325,000,000 and require 2 years for completion, and military experts are understood to have felt that both the time lag and the strain on steel supply which would be involved made the project impracticable. On the other hand, it was pointed out, the oil industry could develop substantial additional supplies within a period of 6 to 8 months with a much lower capital investment.

Cost controversy.—The relative cost of coal-based and oil-based benzene appears to be a matter of some controversy, with some contending that the latter is greater but on the other hand there has been no definite determination of cost by the Bureau of Mines and there is some question whether the coke producers have assigned its full share of cost to the benzene they develop as a byproduct.

The only source of benzene at the present time other than from coke manufacture and such amounts as may be extracted by refineries processing benzene-bearing crudes is from the manufacture of artificial gas. This was never a major source, however, and the output is dropping as natural gas replaces the manufactured product.

Agency Accord

PAD, NPA reach agreement on scope of PAD's activities, but authority over foreign-oil operations not settled

WASHINGTON. — The Petroleum Administration for Defense and the National Production Authority reached formal agreement last week regarding the scope of the former's activities.

The agreement apparently settles the problem of the distribution of petrochemicals, with PAD to retain control over those which are chiefly used within the oil industry itself. Provision also is made for special arrangements giving PAD authority over industries engaged in the production and distribution of machinery or materials used primarly by the petroleum and gas industries.

Still to be settled, however, is the question of authority over the foreign operations of American oil companies, currently a three-way controversy between PAD, the Office of International Trade, which has the export control authority, and the Economic Cooperation Administration, which wants to handle oil, materials, and equipment going into the Marshall-plan countries. In the last war, PAW had responsibility for the entire field of foreign operations.

It is provided that PAD will act as claimant agency before NPA in all matters of materials, and NPA will exercise no jurisdiction over industries or groups coming under the oil and gas agency. PAD's decisions as to the distribution of materials within those industries after allotment by NPA will be controlling, subject only to the requirement that they be in conformity with NPA program determinations.

Agreement terms. — Terms of the agreement were embodied in a formal memorandum, as follows:

1. "The Petroleum Administration for Defense will serve as claimant agency before the National Production Authority as to all phases of the domestic petroleum and gas industries and with respect to such other industries, or industry groups, as may hereafter be designated by NPA. NPA will not exercise jurisdiction over these industries or industry groups and PAD will be the primary point of government contact for the industries or parts of industries covered by this agreement.

2. "PAD's decisions as to the division of materials within such industries or groups, after allotment by NPA, will be controlling, provided, however, that such decisions must be in conformity with specific program determinations made by NPA in connection with such allotments. PAD will be responsible for the initiation of programs and procedures for the distribution of material to such industries or groups. Such programs and procedures, if approved by NPA, shall be incorporated in NPA regulations and orders. To the fullest extent feasible, NPA will delegate to PAD the authority to administer such regulations and orders, either in the name of PAD or in the name of NPA. Such delegations of authority will be subject to such policy conditions as may be specified by NPA, and shall be compatible with procedures established by NPA.

Special arrangements.—3. "Special arrangements will be made from time to time with respect to industries engaged in the production and distribution of machinery or materials used primarily by the petroleum and gas industries and where there is a negligible interest in such machinery or materials among other industries. Such arrangements may include, in appropriate cases, a delegation of authority to PAD to regulate the production and distribution of such machinery or materials, subject to such policy and procedural conditions as may be specified by NPA.

4. "Similarly, special arrangements will be made from time to time as to the distribution of certain materials of petroleum or gas origin which are more readily or efficiently distributable through channels other than the petroleum or gas industries. Such arrangements include, in appropriate cases, a delegation of authority to NPA to regulate the distribution of the materials, subject to such policy and procedural conditions as may be specified by PAD.

5. "NPA and PAD will maintain close liaison in the development of policies, programs, and procedures affecting the petroleum and gas industries and such other materials industries, or parts of industries as may be brought within the framework of this agreement."

Gas' Status

A.G.A.'s efforts for agency appear futile

WASHINGTON.—There were indications last week that the effort of the American Gas Association to have a separate defense agency set up for gas had not been persuasive. Interior Secretary Oscar L. Chapman telling the American Petroleum Institute meeting in Los Angeles that the Petroleum Administration for Defense embraces "all phases of the oil and gas industry," and that men from both the oil and gas branches will be enlisted in what he said will be the only government agency on oil and gas.

The major objections to the creation of a separate agency for gas were

WATCHING WASHINGTON

Bertram F. Linz

Plenty of Rubber

The Government's all-out program for the production of synthetic rubber is rapidly getting under way, with two of the largest of the plants mothballed after the last war already reactivated and in operation.

To the output of these plants, both in Texas, three plants in California, two in Kentucky, and one each in Ohio and Pennsylvania, are expected to add their production by the end of this month. Early in January two plants in Louisiana and one in West Virginia also are scheduled to be in shape to produce.

When all these facilities are rolling synthetic-rubber production may hit a rate of more than 900,000 tons a year, of which nearly 700,000 tons will be GR-S-type and some 75,000 tons butyl. The 1949 production included 295,166 tons of GR-S and 52,237 tons of butyl. The highest output ever recorded in one year was 719,404 tons of GR-S in 1945 and 73,114 tons of butyl in 1946.

The big question in the rubber-consuming industries is whether demand will justify this production in the event that supplies of natural rubber are at a high level. The total possible supply available next year is more than 1,800,000 tons as against a consumption which has never reached 1,200,000 tons.

The three-way pressure of foreign buying, government stockpiling, and industry purchasing have held prices of natural rubber at very high levels and serious repercussions are feared when the Government hits its stockpile target and the supporting pressure of its buying program drops from under the market.

On the other hand, any development in the Far East which reduced the supply of natural rubber available to us could change the picture overnight, a possibility which is at the root of the Government's determination to insure that, no matter what happens, we have an adequate and uninterrupted rubber supply.

Titanium Research

Considerable research is going on both in and out of the Government in the use of titanium, a metal produced from certain sands and also as a byproduct of some iron ores which combines the better qualities of steel and the lightness of aluminum.

Until recently used principally as an oxide in paint, titanium is said to have important possibilities where strength, weight, and heat resistance are major factors as, for instance, in engines of various types and particularly in jet and rocket-propelled airplanes. Other extensive uses are seen in oil-refining processes using high temperatures and pressures and in engines for power production for aluminum manufacture using natural gas as fuel.

Much of the titanium has been produced from sand imported from India but large deposits of titanium-bearing sands are also said to exist in Florida. It is also being produced from iron ores in the Adirondack region, but is not found in the big ore-bearing areas of the Mesabi. However, the recently discovered iron ores in Labrador are said to have a relatively good titanium content.

Special Occasions

Comes now the time for the prudent oil man to make his plans for observing those special occasions during the coming year on which he can celebrate well if not wisely.

For such as he, much careful research has been prosecuted by the Department of Commerce and The Oil and Gas Journal leading to agreement that in January and February alone, with 4½ weeks each between them, there will be 27 "weeks" and 35 "days" devoted to special occasions. If due respect is paid to each event, celebrants in the oil industry apparently will have little time in which to discover another East Texas field, and probably little inclination.

Because of lack of space, the listing was confined to the first month of 1951. In January, aside from such run-of-mine anniversaries as New Year's, the Greek-Russian Orthodox Christmas, and Arbor Day, the younger element undoubtedly will wish to observe National Crochet Week which seems also, but probably unintentionally, to be Odorless Decoration Week. On January 17 we will have Large Size Week and the following day will open Idaho Potato and Onion Week, and January 22 will inaugurate both National Hobby Week and National Turn to Tea Week, neither of which should be ignored.

enumerated in a letter to J. French Robinson, president of A.G.A. by Max W. Ball, former director of the Oil and Gas Division and now a consultant to oil and gas companies.

Ball rejected French's contention that the gas industry has problems of a peculiar nature not related to oil and that supply and transportation of natural gas have no connection with the problems of the oil industry, pointing out that the major part of the country's natural gas is produced by oil companies. Further, he said, the new gas fields are almost exclusively found by oil companies looking for oil rather than by gas companies looking for gas.

Experiences cited.—The gas industry's experience in the last war, when it had to deal with both the Petroleum Administration for War and the Office of War Utilities, was cited by Ball as a reason for a single agency for both fuels, and he told French that if it had not been for the support given by PAW and the Petroleum Industry War Council the gas industry might have fared worse.

If a separate agency was set up for gas, Ball continued, the industry "might find itself in the hands of professional public servants, sincere and able men but men not of the industry and with a natural desire to prolong rather than to end their authority" instead of in an agency "headed and staffed by industry men, men anxious to end their government authority and get back to the industry as soon as possible."

Committee suggested.—The best thing for the gas industry, Ball suggested, would be to secure a permanent gas committee or panel in the National Petroleum Council and the expansion and strengthening of PAD to include the gas functions that the Office of War Utilities had during the last war.

In support of those suggestions, Ball wrote NPC Chairman Walter S. Hallanan, expressing the view that it might be well to create a committee, with the approval of the Interior Department, to study the matter and recommend a revised pattern of organization that would give gas the full representation it deserves.

Falck resigns.—Meanwhile Edward Falck, director of the Office of Energy and Utilities of the National Security Resources Board, resigned to devote his time to private practice as adviser to public utilities and power plants. He will be succeeded by Maj. Gen. Everett S. Hughes, former chief of ordnance of the Army Department, who retired last year.

Falck joined the NSRB in April 1948, as a consultant to the chairman on energy matters and later became head of the division, which includes petroleum and other energy sources. In resigning, he pointed out that he had agreed to serve only on an intermittent basis.

Plenty of Jobs

Bureau predicts substantial opportunities for workers in oil production and refining in next 5 to 10 years

WASHINGTON. — The Bureau of Labor Statistics predicted last week that there will be a substantial number of jobs for new workers in oil production and refining during the next 5 to 10 years.

In a report prepared in cooperation with the Veterans Administration, the bureau expressed a firm belief that the supply of petroleum will be adequate to meet demand for a number of years to come. Large-scale development of a synthetic liquid-fuels industry is foreseen only if an oil-scarcity situation approaches or a national defense emergency develops and, the report concluded, "it appears that although oil may eventually become scarce in the United States, its supply is adequate to permit a high and rising level of employment in the petroleum industry for a number of years."

The bureau pointed out, however, that many factors affect the long-range outlook for employment in the industry, only a few of which are reasonably predictable, such as the generally rising trend in demand for products. Others, it said, are fundamentally uncertain since no one can say exactly how much oil remains underground, where it is, or how long it will be before it is discovered, or the rate at which alternate sources of energy may be developed, such as the adaptation of atomic energy to peacetime uses.

Future uncertain.—"The future is uncertain in another respect," it commented. "The petroleum industry is world-wide and its products are not only essential in the normal operation of our industrial society but also have critical military importance. Unpredictable military and diplomatic factors, therefore, may greatly affect the outlook."

Discussing prospects in the production branch, the bureau saw more jobs in well operation and maintenance, in the rising demand, and the upward trend in number of producing wells and fields.

The gradual rise in employment will create opportunities for new workers, but a much larger number of jobs will result from replacement needs. The latter are substantial in a field of employment as large as oil production and the number of workers who die or retire each year is estimated at about 4,000, with additional thousands transferring into other lines of work.

Most of the new workers will start as laborers, roustabouts, or helpers, but a large number of openings are anticipated for petroleum engineers geologists, geophysicists, surveys, draftsmen, and other technical workers; the bureau emphasized, however, that competition during the next few years is going to be keen in some of these occupations owing to the large number of persons completing training.

Permanent.—On the whole, the report said, "although many uncertainties cloud the employment outlook beyond the next decade, it is probably safe to say that those who do obtain jobs in petroleum production during the next 5 to 10 years will probably continue to hold them over a much longer period."

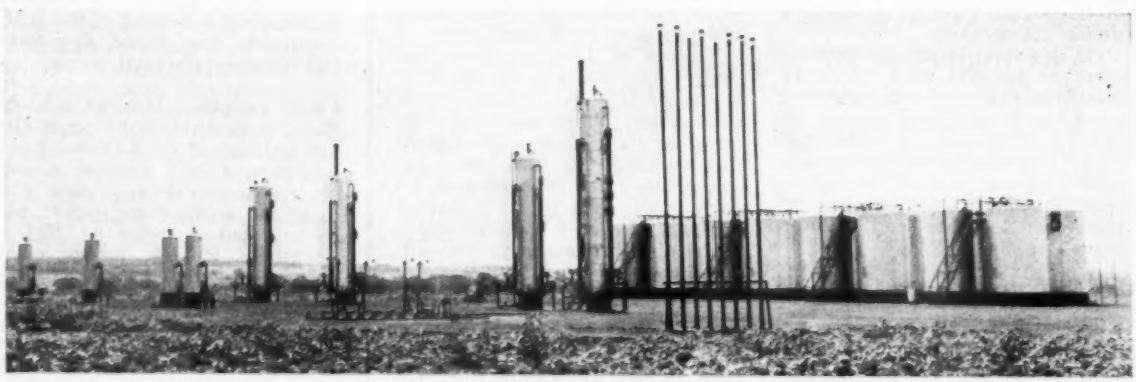
Over the next decade, refinery output will continue to advance but at a slower rate than in many past periods, the study indicated, but even in a general business depression, with output of products falling far below the expected levels, refinery employment should not decline greatly, being more closely related to changes in capacity than to variations in output.

In this field, in addition to the many job opportunities resulting from the expected expansion in refining, replacement needs will be great and there will be many opportunities, not only for laborers, but for technical personnel, particularly chemists, chemical and mechanical engineers, and laboratory technicians.

Southwest favored.—In an area-by-area survey, the bureau and the Veterans Administration found that opportunities for large numbers of new workers are in prospect in the oil fields and refineries of Arkansas, Louisiana, Oklahoma, and Texas, with most of the jobs in Texas. The outlook for rising employment is also good in California. In the Middle Atlantic area—New York, New Jersey, and Pennsylvania—the outlook is for a growing number of refinery jobs, with oil-field employment remaining stable for several years after which it may begin to decline.

Employment is also expected to rise in refineries and remain fairly stable in the oil fields of the east north-central area of Illinois, Indiana, Michigan, Ohio, and Wisconsin. In the west north-central area of Iowa, Kansas, Minnesota, Missouri, Nebraska, and North and South Dakota, slowly rising employment in both oil fields and refineries is in prospect in Kansas, and there is a long-run possibility of new oil field jobs in the Dakotas and Minnesota.

Mountain area.—In the Mountain area a rise in employment in both production and refining is forecast, with the larger increase occurring in production.



MULTIPLE SEPARATORS.—Eight different leases are producing into this centralized arrangement of separators and tank batteries of Phillips Petroleum Co. on the Hillman farm in North Elmore City field of Garvin County, Oklahoma. The four vessels at the left are gas-oil separators and the four taller, vertical vessels in the center are heater-treaters.

New Platforming Units

Shell orders two U.O.P. units with capacity of 15,000 bbl. daily each for Wood River, Houston refineries

George Weber

NEW YORK.—Two new Platforming units, the largest ever designed, have been ordered by Shell Oil Co. for installation at the company's refineries at Wood River, Ill., and Houston. Each catalytic reforming unit will have a charge capacity of 15,000 bbl. daily.

The primary purpose for installing the two new units is for upgrading low-quality naphtha stocks to high-octane components for blending to motor gasoline. However, application of the new facilities to the manufacture of aviation-gasoline components is being studied intensively at this time, according to F. S. Clulow, vice president in charge of manufacturing. While the underlying reason is the expansion and improvement of motor-gasoline production at the two refineries, it is probable that if future military needs for high-octane avgas components demand it, the units will be operated to produce such blending stocks.

The new units were ordered from Universal Oil Products Co. of Chicago, developers and licensors of the reforming process employing a platinum catalyst. U.O.P. will also handle the engineering and design, and field construction has been contracted by Procon, Inc., a newly formed U.O.P. subsidiary. Final design work on the units is now in progress; date for the start of erection has not yet been set. Completion, dependent largely on availability and delivery of materials is tentatively scheduled for October 1951.

Ten times bigger.—Each of the Platforming units will have a capacity 10 times that of the original 1,500-bbl. plant which recently completed its first year of commercial operation at Old Dutch Refining Co.'s refinery at Muskegon, Mich. Over-all process design will conform to that of smaller plants now in operation and under construction, employing the nonregenerative once-through conversion of feed stocks in the three fixed catalyst reactors arranged in series. *(The Oil and Gas Journal, March 30, 1950, page 82.)* Both units will incorporate prefractionation of charge stock, one using existing facilities available in the refinery.

At both Wood River and Houston, Shell will charge low-quality naphthas from West Texas crudes. Feed stocks will fall roughly in the 200°-400° F. distillation range and will comprise about 45 per cent naphthenic hydrocarbons. The expected conversion of between 65 and 90 per cent of such cyclic compounds to aromatic hydrocarbons will yield substantial production of benzene and its homologs. Yield of total debutanized product will be on the order of 95-97 per cent of charge. Product antiknock ratings ranging 93-95 octane number research are anticipated.

Not for benzene.—Despite the expected high yield of aromatics, Shell does not plan the separation and marketing of benzene, toluene, or zylene from the new units, but will utilize the production for gasoline blending. For augmenting the production of such synthetic aromatics, Shell states that it would prefer its own process, now in commercial operation at Wilmington, Calif.

At the Wilmington refinery Shell has been in commercial production of benzene and other aromatics since last March. The Shell-developed process for benzene involves: feed preparation of concentrated methylcyclopentane, its isomerization to cyclohexane, the concentration of natural and synthetic cyclohexane, its dehydrogenation to benzene, and finally, the extraction and purification of benzene to 1° C. nitration grade product. The Wilmington plant is capable of producing 600 bbl. of benzene, but its actual production is limited by availability of proper feed stocks.

Platform capacity trebled.—The two newly announced Shell units will bring about a three-fold increase in the capacity of Platforming facilities now in operation or under construction. In addition to the Old Dutch installation, seven other refiners besides Shell have similar units under way. Totaling 14,500 bbl. in daily charge capacity, these seven units are being installed by seven refiners: one in Pennsylvania and two each in Michigan, Oklahoma, and Texas. Shell, the first major oil company to adopt Platforming, will swell the total capacity now operating or contracted, to about 45,800 bbl. per day.

Oil Tubular Goods

There should be enough, but some pipe lines, other oil projects may have to be curtailed, Fairless tells A.P.I.

LOS ANGELES. — There probably will be enough oil-country tubular goods, provided working inventories are kept to a minimum, but some pipe-line and other oil projects may have to be postponed for lack of steel, Benjamin F. Fairless, president of United States Steel Corp., told A.P.I. delegates here last week.

"There is not enough steel, at present, to satisfy the maximum wants of everybody, but there is a great deal more steel than is necessary to meet America's minimum needs," he said, adding that steel capacity is being expanded and that all needs for petroleum and other uses will be filled in good time provided nothing interferes with the expansion program and there are no strikes or other stoppages in current production.

He said, however, that a fifth round of wage increases is already well under way, and that in the event of a similar wage increase in the steel industry, steel prices would have to rise with increasing costs in order to preserve the financial soundness of members of the steel industry.

Fairless warned that until new plants bring capacity into balance with demand "the steel supply will be tight—tight enough, probably, to cause considerable inconvenience in many industrial fields; but not tight enough, certainly, to work any serious hardship upon our civilian economy, so long as the available steel is used judiciously and effectively where it will be of the greatest advantage to everyone."

Requirements. — Fairless referred to the estimate of steel requirements for the oil and gas industry prepared by a committee of the National Petroleum Council, and said:

"Unfortunately, our industry does not classify its sales of steel in the same way your industry classifies its purchases, so it has not been possible for our marketing experts to determine just how far your estimated wants will exceed our capacity to supply them.

"But as we read it, the NPC committee's report calls for a great deal more steel next year than your industry used last year — considerably more, in fact, than will be available. It would seem to me, therefore, that no useful purpose can be served by regarding this report as the final, absolute, and untouchable word on the

subject, and I feel certain that its author did not intend it to be so regarded.

"If, however, this report is looked upon as the careful, conscientious, preliminary survey that it is, and if it is used as the basis upon which to reconcile our ability to produce steel with your ability to consume it, then it is clearly a document that will be extremely valuable to both of us.

Sees no shortage.—"We believe there will be no shortage of steel for oil-country goods, provided that none is diverted into inventories. Your need for barges and tank cars is being determined, of course, under the Government's allocations program. It is apparent, however, that your requirements for pipe lines and for marketing facilities, as listed in the report, are going to have to be reexamined in the light of the available steel supply.

"You may want to consider pooling proposed oil lines into a few big-inch systems. You may want to inquire into the possibility of spreading the construction of new gas lines over a longer period of time. That is your business. You would know how and where the pipe we can supply can be used to the greatest possible advantage. I wouldn't.

Distribution system.—"United States Steel is now setting up—with painstaking care—a well-planned system to insure the equitable distribution of available civilian steel supplies among all of our customers, with particular attention to the essential needs of small business and of new businesses. Under this system, the oil industry will be able to get its full share of civilian steel, over and above those quantities which it will obtain under the government allocations program."

A.P.I. Officers

Frank Porter reelected Institute head for 1951

LOS ANGELES. — The first annual meeting of the American Petroleum Institute to be held on the West Coast in a decade did not suffer in attendance because of the distance from many oil operations and offices, for the registration of close to 5,000 was about equal to that of other postwar meetings.

There was the usual number of technical, group, and committee meetings, but the program as a whole reflected the industry's present disposition to look outward toward its position in the community and in the nation's economy, with less preoccupation with its internal problems.

This was illustrated by the attention and applause given a number of speakers who urged the industry to fight hard to maintain the American way of life and a competitive, free-enterprise system, particularly Frank M. Porter, president of the A.P.I.; Jake L. Hamon, president of the Mid-Continent Oil and Gas Association; and Bernard L. Majewski, vice president of Deep Rock Oil Corp. *(The Oil and Gas Journal, November 16, 1950, pages 181-187).*

Porter reelected. — The Institute reelected Porter as president and W. Alton Jones, president of Cities Service Co., as chairman of the board of directors. Also reelected were B. Brewster Jennings, president of Socony-Vacuum Oil Co., Inc., treasurer; T. E. Swigart, president of Shell Pipe Line Corp., Houston, vice president for transportation; and Lacey Walker, secretary and assistant treasurer.

Three new officers were elected: Harry J. Kennedy of Continental Oil Co., vice president for marketing; J. C. Donnell, II, of Ohio Oil Co., vice president for production; and W. L. Stewart, Jr., Union Oil Co., vice president for refining.

New directors added to the board were: C. H. Wright, Sunray Oil Corp., Tulsa; James J. Cosgrove, chairman of the board, and Harry J. Kennedy, vice president, both of Continental Oil, Houston; J. S. Leach, executive vice president of The Texas Co., New York; Theodore Sutter, Baker Oil Tools, Inc., Los Angeles; Rawleigh Warner, Pure Oil, Chicago; Fred M. Mayer, Continental Supply Co., Dallas, and Clyde T. Foster, president of Standard Oil (Ohio), Cleveland.

Competition

There is more now than ever before, Taylor says

LOS ANGELES.—The attack on bigness in business, as illustrated by current antitrust suits against the oil industry, is a challenge to the existence of competition for all business and should be met by a vigorous campaign of public education, the American Petroleum Institute was told by Reece H. Taylor, president of Union Oil Co.

Speaking at the closing session of the annual meeting, Taylor said there is more competition in business now than there was a decade or two ago when many of the country's big companies were smaller in actual size but much bigger in percentage of markets controlled. From this he argued that the Government's campaign to break up integrated industries is really an attempt to substitute controls for competition.

Less power.—Using his own company as an example, Taylor said that in 1910 Union Oil did 23 per cent of the total oil business in its area whereas today it does only 12 per cent although in dollar sales it is 16 times as big. This means the company has less power rather than more power, he said, and is due to the fact that all productive facilities had to grow because one-and-two-thirds as many people are consuming two-and-one-half times as much goods.

"There is nothing more sinister in the fact that Union Oil is now 16 times bigger than it was in 1910 than there is in the fact that the University of California is 13 times bigger or the YMCA is 14 times bigger," Taylor declared.

Determining factor.—The factor that determines a company's growth is consumer acceptance of its products, Taylor pointed out, saying that individual citizens make choices every day which in the aggregate determine which companies survive and grow. It is freedom to grow which is responsible for technological and industrial progress, but we may be dangerously close to the day when freedom to succeed will have little or no meaning if we trade economic freedom for Government domination, he added.

The remedy, Taylor said, is to educate the entire public—starting with oil-company employes—on the relative place of big companies in the nation's economy, the factor of competition in industrial growth, and the danger of Government domination.

Public Relations

O.I.I.C. program praised; larger campaign planned

LOS ANGELES. — The public-relations program of the oil industry was hailed as a success by the American Petroleum Institute here last week and plans were approved for an even larger program for 1951.

Interest in public relations was evident throughout the entire 4-day annual meeting, as many of the principal speakers dealt at some length on one phase or another of the industry's standing with the public and with the Government.

The Oil Industry Information Committee has completed its work of reorganizing and integrating the operations of its field offices, the A.P.I. public-relations staff, and the work of the Western Oil and Gas Association and other groups within the industry. This augmented committee held daily sessions during the convention and presented an enlarged advertising and information program which was approved by the A.P.I. directors for 1951.

Officers elected.—John Dupree of Socony-Vacuum Oil Co., Inc., New York, was elected 1951 chairman of the O.I.I.C., succeeding George H. Freyermuth of Standard Oil Co. (N. J.). Vice chairmen elected were: Walter E. Black, of Esso Standard Oil Co., Philadelphia, for the Eastern district;

Charles Z. Hardwick, vice president of sales, Ohio Oil Co., Findlay, Ohio, for the Middle West region; Charles E. Simons, vice president of Texas Mid-Continent Oil and Gas Association, Dallas, for the Gulf-Southwest region; and C. Haines Finnell, Union Oil Co., Los Angeles, for the West Coast region.

More widespread.—At a general public-relations session, H. B. Miller, executive director of the O.I.I.C., reported that the industry observance of Oil Progress Week in 1950 was more widespread and had a much greater impact of the public than the 1949 observance. This session also brought out that oil men throughout the industry are learning much about the best ways to reach the public and to deal with medium of information.

Robert T. Haslam, retired vice president of Standard Oil Co. (N. J.), was the guest of honor at a testimonial dinner of the O.I.I.C., and was presented with a resolution in appreciation of his work as the organizer of the oil industry's first national public-relations program.

Thread Compounds

New agents for casing to be used on trial basis

LOS ANGELES.—New thread compounds primarily for use on casing and tubing in service on high-pressure wells, having successfully passed extensive laboratory tests, shortly will be placed in field usage for a 6-months' trial.

This development was brought out in the session of the special American Petroleum Institute committee on pipe research. The new compounds are the result of some 18 months' research conducted by Mellon Institute of Industrial Research, Pittsburgh, under the auspices of this subcommittee. While yet to be proved by the field tests, the researchers are hopeful it will prove to be an improvement.

The grease base used as a vehicle in the compounds is composed af a naphthenic-base oil, aluminum stearate, powdered silica, and Silicone fluid. The thread compounds were then prepared by adding various percentages of powdered lead, zinc dust, copper powder, and graphite.

Lab tests.—Laboratory tests conducted on the compounds included making up A.P.I. coupled joints of tubing after coating both the plain and mill ends. Hydrostatic tests at pressures up to 10,000 psi. were made with the joints being filled with kerosine. In some tests the pressures were held for about 2 months. Another test was observation of the effects of temperature in the range of 300° F. Also since experience has indicated that vibration incurred during the shipment from mill to field often results in failure of the thread-compound seal, test joints were subjected to prolonged tumbling and rolling.

Next step in the program is that some of the major oil companies in ordering new tubing and casing will specify that the most promising of the experimental thread compounds be used. Following shipment of these tubuar goods to the field the mill-end joints will be tested to determine the effect of shipment on joint tightness. After the strings are run they will be closely observed for about 6 months.

If the new compounds successfully pass the field tests, it is thought that patents on their formulation will be held by Mellon Institute but that licenses to manufacture will be readily available to all interested manufacturers. The compounds would be A.P.I. recommended.

P.E.S.A. Meeting

Steel allocation for oil equipment tops discussion

LOS ANGELES.—The Government's program for allocating steel for manufacture of oil-industry equipment was the chief topic of discussion at the semiannual meeting of the directors of the Petroleum Equipment Suppliers Association which met here in conjunction with the annual meeting of the American Petroleum Institute.

Hugh A. Stewart, acting director of the Petroleum Administration for Defense, and Carroll D. Fentress, assistant director of the Oil and Gas Division, outlined the allocation plans now being set up and explained the reasons for the slow start of the program. They asked for assistance in obtaining qualified personnel from the industry to staff PAD, and in working out specific problems encountered in the allocation program, particularly in the use of nickel steel for petroleum equipment.

Nickel steel.—The nickel-steel problem was made an immediate project of the new manufacturers' committee of P.E.S.A., and a questionnaire will be sent to manufacturers to determine the requirements of this and other alloys in the production of oil equipment.

Plans for the International Petroleum Exposition in Tulsa in 1952 also were discussed by the directors at the request of William B. Way, general manager of the exposition. A special committee was appointed to survey the P.E.S.A. membership as to the duration of the show and the hours of the day it should be open.

The directors also announced that plans have been completed to hold the next annual meeting of the association at the Chateau Frontenac Hotel, Quebec, Canada, June 17-21, 1951.

Pipe Liners' Club Elects

LOS ANGELES.—J. H. Peper, Buckeye Pipe Line Co., New York, was elected president of the Pipe Liners' Club at the group's annual meeting during the American Petroleum Institute here last year.

Others named to the social organization, which meets annually during A.P.I. conventions, were: R. B. McLaughlin, Texas Pipe Line Co., Houston, vice president; Loren B. Kahle, Interprovincial Pipe Line Co., Edmonton, Alta., named to the board of governors; J. L. Burke, Service Pipe Line Co., Tulsa, chairman of the membership committee; O. F. Moore, named to the finance committee; and Oliver C. Klinger, Oildom Publishing Co., Bayonne, N. J., reelected secretary-treasurer.

Anderson Named Club Head

LOS ANGELES.—P. G. Anderson, Lion Oil Co., El Dorado, Ark., was elected president of the Transportation Club of the Petroleum Industry at the annual meeting held during the American Petroleum Institute's annual convention.

Others named include: E. D. Sheffe, Esso Standard Oil Co., New York, and P. H. Kuhns, Continental Oil Co., Ponca City, Okla., vice presidents; Raymond R. Hooper, Cities Service Oil Co., New York, reelected secretary-treasurer; and A. D. Carleton, Standard Oil Co. of California, San Francisco, named chairman of the board of directors.

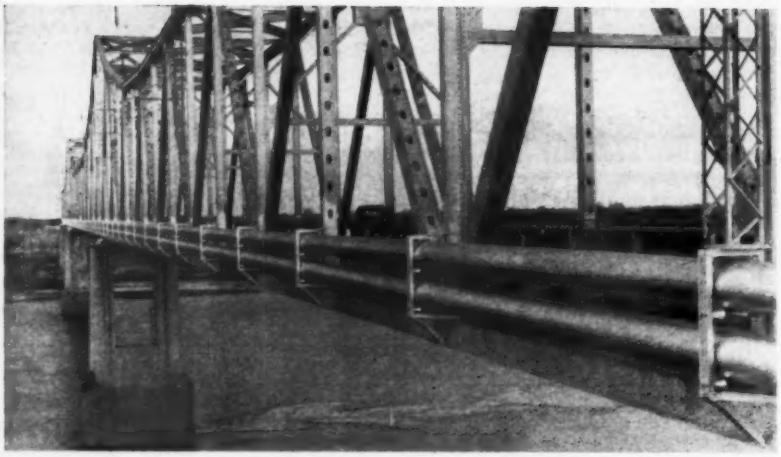
A. F. Winn, Skelly Oil Co., Kansas City, Mo., was elected vice chairman. New directors are: C. F. Dowd, Tide Water Associated Oil Co., New York; S. A. Ironsides, General Petroleum Corp., Los Angeles; and John Ruan, Ruan Transport Corp., Des Moines.

Twenty-five Year Club

LOS ANGELES.—The eleventh annual banquet of the Twenty-five Year Club of the Petroleum Industry was held at the Los Angeles Country Club November 14, with Alexander Fraser, chairman of the executive committee of Shell Oil Co., and president of the club, presiding.

At the conclusion of the dinner, Fraser turned over the gavel to his successor, Robert W. McDowell, president of Mid-Continent Petroleum Corp., Tulsa, who will head the club for the coming year.

Holbrook T. Ashton, manager, central marketing region, Socony-Vacuum Oil Co., Inc., St. Louis, was reelected executive secretary of the club.



The Greenville bridge over the Mississippi River, used by Tennessee Gas Transmission Co. to carry four 26-in. natural-gas pipe lines. For this privilege, T.G.T. is retiring bonded indebtedness of the bridge for $2,700,000. Two of the 26-in. lines are shown in this photograph, the other two being on the opposite side of the bridge.

River Crossing

Greenville bridge used by T.G.T.; city bonds retired

HOUSTON.—The expanding eastern market for Gulf Coast natural gas has indirectly resulted in a huge, free bridge across the Mississippi River for the people of Greenville, Miss.

For the privilege of placing four 26-in. pipe lines on the bridge structure, Tennessee Gas Transmission Co. is retiring the bonded indebtedness of $2,700,000. In celebration, a "free bridge" ceremony was recently held on the 12,990-ft. steel bridge.

In addition to marking the end of the 75-cent toll charge, the ceremony meant that T.G.T. had completed placing its four lines on the bridge. These lines carry more than one billion cubic feet of natural gas per day across the Mississippi River.

Agreement.—The free bridge arrangement came about through an agreement between T.G.T. and the city of Greenville, owner and builder of the bridge. T.G.T. has had two 18-in. lines on the bridge for some time, but this year's $100,000,000 expansion program made these inadequate. In order to put the four heavier pipe lines on the bridge, in lieu of the two smaller lines, it was necessary for the load stresses on the bridge to be lightened. This was accomplished by removing the old reinforced-concrete-slab roadway and replacing it with a lighter weight armored steel deck and concrete roadway.

The cost of replacing the old roadway was borne by T.G.T. In addition, the gas company agreed to pay the city of Greenville an annual rental of $150,000 until 1968 to retire the bonded indebtedness against the bridge.

At Greenville, T.G.T. has its major river crossing, its largest and recently expanded compressor station, a land office, and approximately 100 regular employes. This is more employes than at any other point on the system with the exception of the Houston headquarters.

CANADA

Geophysical Activity

117 crews now at work in western Canadian areas

CALGARY. — Geophysical exploration for potential oil and gas structures in western Canada now involves a total of 117 crews—a level far higher than in 1949 and previous years although a slight drop from the 120 crews operating on the prairies 2 months ago. Crews now operating include 104 seismographs, 10 gravitymeters, 2 airborne, and 1 ground level magnetometer.

In Alberta there are 87 geophysical crews, including 76 seismographs, 8 gravitymeters and the 3 magnetometers. In Saskatchewan there are 27 crews, including 25 seismographs and 2 gravitymeters. In Manitoba there are three seismograph crews.

Imperial Oil, Ltd., the leader in total number of crews, accounted for the major change in Canada's geophysical picture. The firm released five Carter Oil Co. crews, including three seismographs and two gravitymeters, to reduce the number of crews working for Imperial from 15 to 10. Of these, eight are in Alberta; and two in Manitoba. All are seismograph crews.

Texaco Exploration Co. and Shell Oil Co. tie for second place, each having nine crews in the field. Texaco's crews include eight seismographs and one gravitymeter in Alberta, and Shell has six seismographs in Alberta and three is Saskatchewan.

Socony - Vacuum Exploration Co. has eight crews in the field, and Canadian Gulf Oil Co. six.

Seven parties. — California - Standard Co. now has seven parties working, which includes five seismograph crews in Alberta, one in Saskatchewan, and one in Manitoba. Phillips Petroleum Co. and Husky Oil & Refining Co. as a team have seven seismograph crews, all working in Saskatchewan.

Other companies having crews in the field are: Hudson's Bay Oil & Gas Co.-Union Oil of California team, six crews in Alberta; Amerada Petroleum Corp., five crews in Alberta; Sohio Petroleum Co. Group, five units in Saskatchewan; Canadian Superior Oil Co. of California, Ltd., four crews in Alberta; Seaboard-Honolulu - Barnsdall Group, four crews in Alberta; Pacific Petroleums Group, Stanolind Oil & Gas Co., and Sun Oil Co., three crews each in Alberta; British American Oil Co., Benedum-Trees-Calvan Group, and Cities Service Petroleum Co., two crews each in Alberta.

Canadian Crude to U. S.

SUPERIOR, Wis.—The first crude to come by pipe line from Alberta crossed the international boundary last week, and is moving toward the tank farms of Lakehead Pipe Line Co., Inc., here.

Interprovincial Pipe Line Co.'s 1,150-mile line was recently completed, and the initial flow of crude left Redwater field, near Edmonton, Alta., on November 4.

Flow will be increased as crude begins arriving into storage.

The Interprovincial system includes a 321-mile 16-18-in. section in the United States operating under Lakehead Pipe Line. This section runs from near Gretna, Man., across Minnesota to Superior.

Imperial Cuts Prices

TORONTO.—Imperial Oil, Ltd., announced reductions in prices of gasoline, kerosine, and light fuel oils in most of Manitoba and Saskatchewan, as the first Alberta crude to flow through Interprovincial Pipe Line Co.'s new line reached refineries at Regina, Sask. The reductions in wholesale gasoline and kerosine prices range up to about 4 cents per gallon and in light fuel oils to about 1 cent per gallon.

Until now, Alberta crude has moved eastward by rail. Lower cost transportation by the pipe line makes possible further extension of price benefits which have resulted from the oil discoveries in western Canada.

Petrochemical Activity

More than 25 oil companies are engaged in various phases of petrochemical industry, with trend continuing upward

George Weber

NEW YORK.—More than 25 oil companies are now engaged in various phases of the petrochemical industry, manufacturing and segregating both crude and finished chemicals from petroleum and natural gas. While the oil industry proper still produces fewer finished chemicals in smaller volume than the true chemical companies whom it supplies with basic materials, the tempo of oil-company participation in the growing industry is increasing.

According to final official statistics recently released by the U. S. Tariff Commission ("Synthetic Organic Chemicals, United States Production and Sales, 1949"), the production of nearly 5 billion pounds of crude chemicals from petroleum and natural gas for conversion to synthetic organic chemicals was reported by companies in 1949. Of the total of 4,986,768,000 lb., 992,621,000 lb. were aromatics and naphthenes and the remaining 3,994,147,000 lb. were aliphatics. About 61 per cent of these crude chemicals were sold as such, and 39 per cent were converted by the companies reporting their production.

The year 1949 registered a 27 per cent increase over 1948 in crude petrochemicals reported to the Tariff Commission. A much greater gain is indicated for this year. One authoritative survey predicts a 1950 total of 8 billion pounds of raw materials from petroleum going into synthetic organic chemicals. Some industry leaders are quoted as estimating that petrochemicals in general, including such inorganics as the ammonia products derived from natural gas, may reach the 12-billion-pound mark this year.

Olefins.—Olefins, which comprise the bulk of the petroleum "building block" chemicals, are expected to continue leading the petrochemical parade volumewise. Led by ethylene, this class of aliphatic crude chemicals will reach an estimated consumption by chemical companies of over 3.3 billion pounds this year. A market survey recently completed by a well-known engineering firm shows that olefins produced for chemical conversion will appreciate in value from an estimated $154,000,000 this year, to an estimated $237,000,000 by 1955. Ethylene production estimated at a value of $87,000,000 this year, will reach a total value of $129,000,000 for 1955, according to the same estimate.

Crude aromatics.—Crude aromatics and naphthenes from petroleum continued their upward climb from a low postwar total of 604,000,000 lb. in 1946, to reach a total of 992,621,000 lb. last year. The swift upsurge in demand for crude aromatic chemicals will reflect even higher production this year. Petroleum-derived aromatics, particularly benzene, are accorded greatly increased importance in the future, as the projected supply from coal carbonization will fall far short of future demand. Whether or not the Government builds the much-discussed coal-conversion facilities, the short-range outlook for closing the gap on benzene needs is for synthesis of that important basic chemical from petroleum sources. In addition to the present production by Pan American Refining Corp. at Texas City, Tex., and Shell Oil Co. at Wilmington, which will probably not top 9,000,000 gal. this year, a third major oil company is expected shortly to announce plans for a large-scale benzene project and others will follow with further facilities next year.

Final figures on crude chemicals from petroleum and natural gas reported to the Tariff Commission show the following 1949 production:

Product—	1,000-lb. production 1949	1948
Aromatics and naphthenes:		
Naphthenic acid	23,654	25,420
Toluene, all grades	330,582	358,849
Xylene, all grades	356,122	382,696
All other aromatics	282,263	125,142
Total	992,621	892,107
Aliphatic hydrocarbons:		
C_2 hydrocarbons	1,151,494	383,448
C_3 hydrocarbons	1,087,333	713,629
C_4 hydrocarbons	1,459,240	1,656,689
C_5 hydrocarbons	10,676	9,225
All other aliphatic hydrocarbons	285,404	259,209
Total	3,994,147	3,022,200
Grand total	4,986,708	3,914,307

Participating in the production of the above crude chemicals, or the synthesis of intermediates and finished products from them, were the following oil companies: American Mineral Spirits Co., Atlantic Refining Co., Cities Service Oil Co., Cities Service Refining Co., Continental Oil Co., Esso Standard Oil Co., General Petroleum Corp., Gulf Oil Corp., Humble Oil & Refining Co., Kendall Refining Co., Magnolia Petroleum Co., Pan American Refining Corp., Phillips Petroleum Co., Pure Oil Co., Richfield Oil Corp., Shell Oil Co., Sinclair Refining Co., Skelly Oil Co., Socony-Vacuum Oil Co., Inc., L. Sonneborn Sons., Inc., Standard Oil Co. of California, Standard Oil Co. of Indiana, Sun Oil Co., The Texas Co., and Union Oil Co. of California.

(A complete section on petrochemical activity was carried in the November 2 issue of The Oil and Gas Journal.)

ROCKY MOUNTAIN

Worland Investment

Firms to increase return by $2,500,000 per year

WASHINGTON. — A $15,000,000 investment by three oil companies will increase the return from the Worland, Wyo., oil field by $2,500,000 a year by recovery of products formerly wasted, it was reported last week by Interior Secretary Oscar L. Chapman.

Chapman referred to recently completed construction of a 340-mile 12¾-in. pipe line, a sulfur-extraction plant and gasoline plant, and a compressor station by Pure Oil Co., Texas Gulf Sulphur Co., and Montana and Wyoming Pipe Line Co., which will permit the extraction of sulfur from the natural gas associated with the crude and the marketing of the now nonpoisonous gas.

The 25,000-acre area, 53 per cent of which is federally owned, is operated under a unit agreement approved July 25, 1945, by Pure, which, the secretary said, has had to make a larger capital outlay than is normal but stands to gain added profit from the marketing of formerly wasted products.

The Worland field had the highest hydrogen-sulfide content of any field gases up to the time it was proved—33 per cent—and presented serious industrial and health problems that had to be worked out by the operator, Chapman explained. Initially the poisonous gas and recoverable natural gasoline were flared and workers moved about the field in pairs for mutual protection. The hazard was so great that when a connection broke on the discovery well it was set on fire rather than risk the lives of men and livestock in the area.

Other difficulties.—Other difficulties developed as operators entered the field and drilled on tracts not covered by the unit agreement, necessitating offset wells, some of which had very high gas-oil ratios which rapidly dissipated reservoir energy. Complete unitization of the field was

achieved last May 1, whereupon the high gas-oil ratio wells were shut in and gas production was restricted to 30,000,000 cu. ft. daily as against some 55,000,000 cu. ft. which theretofore had been flared.

With the construction of the new facilities for handling the gas it was put through the sulfur-extraction and casing-head-gasoline plants where an average of 300 tons of pure sulfur and 30,000 gal. of liquid products are obtained daily, the residue of approximately 15,000,000 cu. ft. of sweet gas being mixed with sweet gas from an upper formation for marketing through the pipe line. The return is estimated at $8,250 a day from gas formerly wasted.

To make this possible, Chapman reported, it was necessary for Pure to expend about $3,000,000 on the gasoline plant, while Texas Gulf Sulphur spent about the same on the sulfur plant and the pipe-line company put $9,100,000 into the pipe-line and compressor plant.

Dakota Activity

12,000,000 acres under lease in North Dakota

A HOPEFUL industry has invested in a leasing play involving approximately 12,000,000 acres in North Dakota. Most of the attention has been centered on the Williston basin, and recently an interesting wildcat was completed in the Medicine Buttes area of the basin.

The well was considered important because it established a new drilling record for the state, and was the first test in Mercer County. Located in C NW NE 28-142n-89w, the F. F. Kelly and Plymouth Oil Co. 1 Fritz Leutz finished dry at 12,526 ft. in what was believed to be Ordovician. No formation tops have been released, but the elevation was reported to be 2,284 ft., KB.

The previous depth-record holder was California Oil Co. 1 Kamp, 3-154n-96w, Williams County, completed dry in 1938. On elevation of 1,918 ft., this wildcat went to 10,281 ft. in Devonian. In the same county, some 6 miles northeast of the California well, Amerada Petroleum Corp. is currently drilling below 6,000 ft. at a test that could topple the new record. It is rumored that this well may go beyond 12,000 ft., but just how far has not been speculated upon. The wildcat, 1 Clarence Iverson, is located on the Nesson anticline. Spotted in CSW SW 6-155n-95w, it has elevation of 2,389 ft., KB.

1950 operations.—Completions in North Dakota this year include: Roeser & Pendleton 1 Weber, CNE NE SE 35-133n-95w, Emmons County, dry, total depth 5,556 ft. in granite, elevation of 2,012 ft., KB; Samedan Oil Co. 1 Hanson, CNE 10-146n-81w, McLean County, dry, total depth 9,033 ft. in Ordovician, elevation 1,995 ft., KB; and the Leutz well. Current activity includes: Amerada's well; Magnolia Petroleum Co. 1 State (the company's first venture in the state), CSE NE 36-141n-73w, Kidder County, scheduled to go to the granite expected before 6,000 ft.; a joint test by Phillips Petroleum Co. and Carter Oil Co. in Morton County, the 1 fee, C NE NW 29-136n-81w; and Roger Wilson 1 fee, C NE NE 28-158n-72w, Pierce County, planned as a 6,700-ft test to the Ordovician.

SOUTHWEST

Texas Oil Production

160,083-bbl. daily cut in allowable made by Railroad Commission following testimony that stocks are ample

Leigh S. McCaslin, Jr.

AUSTIN.—After hearing testimony that there are ample stocks of crude oil and heating oil, the Texas Railroad Commission cut the state's allowable production to 2,556,944 bbl. daily for December—a slash of 160,083 bbl.

No action was taken to reduce the per well MERs (maximum efficient rate of production) in the West Texas Canyon reef fields. It had been anticipated that the commission might make a special reduction for these fields because of declining bottom-hole pressures. However, the body is apparently satisfied at present with testimony presented by operators in the fields at a recent special hearing. During the short state-wide hearing, the question of imports of foreign oil came up for the first time since the Korean war started. H. P. Nichols, East Texas Oil Association, said: "As long as the big oil companies are allowed to import indiscriminately into the United States, we are going to have a depressed market demand for Texas oil."

It is considered by some that the question of imports will be strongly revived if Texas allowables continue to be reduced. The December slash is the third consecutive monthly reduction since the all-time record allowable of 2,832,730 bbl. daily for September. In October, the allowable was cut 125,162 bbl. and in November 26,608 bbl.

Politics.—In addition to imports, state politics may enter more strongly into the statewide hearings of the next few months. The fifty-second Legislature is scheduled to convene in January, and it will be faced with a none-too-bright state financial picture. The gross-production tax on crude oil is a major contributor to the state's income. Of the $85,296,698 in cash receipts for September and October, the crude tax accounted for $16,245,042. The legislators will be anxious to keep production high in order to minimize possible new tax levies.

At the state-wide hearing preceding the allowable cut for December, George Goad, Tide Water Associated Oil Co., told the commission that "If we do not curtail production now, by January you'll have problems of where to put the oil." He noted that the body had expressed concern a month ago about the possibility of a heating-oil shortage. On this score he said: "A month has gone by and we have had no cold weather. I would say that almost nothing could happen that would cause a shortage of heating oil before February."

Com. Olin Culberson asked Goad how much of the excess crude could be attributed to imports. Goad told the commissioner he was not qualified to answer the question.

The December reduction was accomplished by cutting 1 day from the state-wide and East Texas field producing schedules. This will mean 20 days state-wide and 19 for East Texas. The Fullerton field of West Texas was kept at 19 days and the Willamar field in Southwest Texas on 12. This is designed to prevent the waste of casing-head gas. Allowables by districts will be:

	Nov. 11	Dec. 1	Reduction
District 1	34,348	33,386	962
District 2	156,084	145,114	10,970
District 3	469,594	444,451	25,143
District 4	239,493	225,576	13,917
District 5	44,774	41,709	3,065
District 6	104,058	97,450	6,608
East Texas	295,025	272,484	22,541
District 7B	87,814	84,075	3,739
District 7C	76,421	72,798	3,623
District 8	905,912	843,598	62,314
District 9	198,561	191,370	7,191
District 10	104,943	104,935	10

With natural-gasoline and distillate production estimated at 327,186 bbl. daily, total hydrocarbon allowable for December will be 2,884,130 bbl. daily. The new crude allowable is 176,944 bbl. per day above the Bureau of Mines estimate of market demand.

Producing days.—The argument over how many days to produce the East Texas field rose again during the hearing. H. P. Nichols of Tyler asked for the 19 days which the commis-

sion granted. However, Bascom Gist, representing the Tyler Chamber of Commerce and others, petitioned for 20 or 21 days. Nichols based his request on a drop of 23 psi. in the field's bottom-hole pressure over the past 6 months. Gist said that his clients "are still of the opinion that if allowed to continue on 20 or 21 days the East Texas field will level off above 1,000 psi., and will not go below that level." Pressure in the field at the end of October was 1,016.65 psi.

The next state-wide hearing will be held in Austin on December 14. At that time, the commission will open the question of reduced gas-oil ratios for new fields and fields where a ratio has not been established. At present the limit on gas-oil ratios for oil wells is 2,000 to 1. The commission proposes to cut this to 1,000 to 1.

New Cementing Rule

Texas commission adopts order to conserve pipe

AUSTIN.—The Texas Railroad Commission has entered a new rule of state-wide application providing for stage cementing as general practice, which will help to relieve the critical shortage of steel pipe.

The new ruling (Rule 12) requires surface casing to properly protect fresh-water sands which may later be utilized for water supply.

Cementing shall be by the pump and plug method and sufficient cement shall be used to fill the annular space back of the casing to the ground surface, or to bottom of cellar.

Where pressure conditions are unknown, or known to be high, blowout preventers, control heads, and other connections shall be installed to keep the well under control at all times. These shall be installed as soon as surface casing is set.

Operator shall, before drilling and setting casing in his first well in a field or area, contact the board of water engineers and obtain a letter stating where the fresh-water sands are found in the area in question.

Multistage process.—In lieu of setting the full amount of surface casing required to protect fresh-water sands, an operator may, upon written application to the commission, use the multistage cementing process. To do this he must outline in his application to the commission the minimum amount of surface casing desired to be set, before operations are commenced, and permission obtained from the commission.

When the operation is completed, he must then file with the commission an affidavit made by the cementing company's representative, showing where the stage-cement tool was set and number of sacks of cement used.

In using the multistage cementing process, sufficient cement shall be used that is equivalent to the volume of the annulus from the cementing tool to a point midway between the shoe of the surface string and the surface. Compliance with the above will be considered if a temperature survey shows that top of the cement is at least one-third of the distance from the shoe of the surface string to the surface.

Exploration Meet Set

FORT WORTH.—A geological and geophysical program, arranged primarily to present combined geophysical and geological pictures of certain future oil provinces of the South-Central states will be held here November 30-December 1 by the Society of Exploration Geophysicists.

Sponsored by the Fort Worth Geophysical Society, Fort Worth Geological Society, and the Dallas, Ark-La-Tex, Tulsa, and Permian basin geophysical societies, the regional exploration meeting will feature papers of general interest and discussions of seismic-velocity problems.

The geology and geophysics of the Delaware, Anadarko, Plainview, and Marfa basins, and of the Ark-La-Tex area, wil be presented by 10 separate papers. There will also be a paper on the geology of the northwest shelf area of the Permian basin and papers on the seismic history of Southeast New Mexico and of the Reynosa oil field of Mexico.

Papers of general interest will include a discussion of our responsibility for finding a continuing low-cost supply of oil and gas for our country's energy requirements, and a description of a new method of determining the dip and strike of subsurface formations in the earth from measurements taken in a single well bore.

GULF COAST

Mushrooming Mustang

New extensions to oil and gas-distillate field in Corpus Christi Bay holding attention of South Texas operators

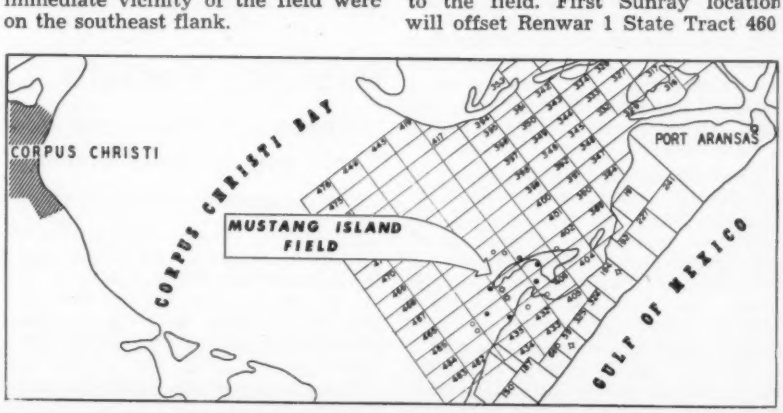
Joseph A. Kornfeld

CORPUS CHRISTI. — Development of Mustang Island oil and gas-distillate field in Corpus Christi Bay is commanding the attention of South Texas operators. Discovered slightly more than a year ago, the field has mushroomed into an area with important reserve potentialities, with eight oil wells and five gas-distillate wells completed to date.

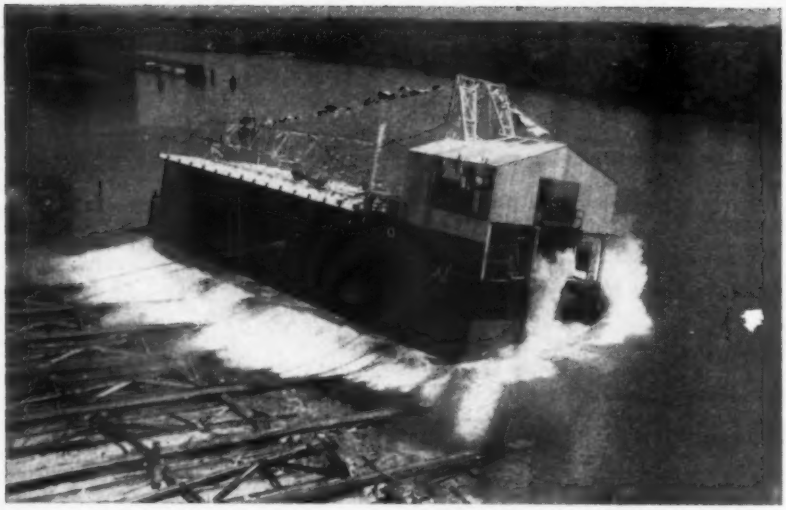
From the Frio series of Oligocene age, six gas-distillate reservoirs have been logged and another oil reservoir is under development. Producing depths range from 6,800 to 8,000 ft. The only dry holes drilled within the immediate vicinity of the field were on the southeast flank.

Latest extension is Renwar Oil Corp. 2 State Tract 460, which cored an oil sand slightly below 7,200 ft and is now coring below 7,400 ft This test extends the field ¼ mile eastward. The company's 1 State Tract 460, which marked an important 3,300-ft. southwest oil extension flowed 14 bbl. of oil per hour on a ¼-in. choke from perforations from 7,245-58 ft. on completion tests last month.

Sunray in play.—Latest operator to enter the field development is Sunray Oil Corp., which plans immediate exploration of its 3,520-acre state lease in Corpus Christi Bay adjacent to the field. First Sunray location will offset Renwar 1 State Tract 460



Map of Mustang Island field. (Courtesy Zingery Map Co., Houston.)



This compact marine drilling barge, being launched when this photograph was taken, is now drilling for Renwar Oil Corp. in Corpus Christi Bay, in development of Mustang Island field. It is 134 ft. long, 38½ ft. wide, and 11 ft. deep. Drilling equipment includes jackknife derrick, draw works, two engines, rotary, mud pumps, fuel-oil tanks, booms, and fuel-oil-transfer pump.

Present Sunray holdings were acquired in December 1949 at a Texas state land lease sale.

Atlantic Refining Co. has announced plans to drill a 8,500-ft. test at 1 State Tract 341.

Marine rigs.—Currently, four rigs are operating in the field for Renwar, Sinclair Prairie Oil Co., Atlantic Refining Co., and Coy Burnett. Glasscock Drilling Co., Corpus Christi, has three marine rigs in operation in this field, two for Atlantic, and one for Renwar. The latter is Rig 6, which is now on its second job since it first started drilling in Corpus Christi Bay on September 16. It is working at Renwar 2 State Tract 460. The most compact marine drilling rig designed to date, is mounted on a drilling barge 134-ft. long, 38½ ft. wide, and 11 ft. deep. The barge is subdivided by water-tight bulkheads to form six ballast tanks and one fresh-water tank. It is equipped with a 5-ft. high structure supporting the derrick substructure and a pump room with a 6-ft. surrounding seawall. Other features include active and setting mud pits, reserve mud pits, mud house, a 1,000-gal. portable water tank, pipe racks, living quarters and galley, and a radio room.

The drilling equipment consists of a jackknife derrick, draw works with extended skid and two engines, rotary, two mud pumps, fuel-oil tanks, lubricating-oil tank, two 5-ton booms, drilling-water pump, fuel-oil-transfer pump, and fresh-water pressure set.

Casing program.—Current practice is to set about 125 ft. of 16-in. conductor pipe, 1,500 ft. of 10¾-in. surface pipe, and the long string of 5½-in. casing immediately below the gas-distillate or oil reservoir. This is gun-perforated for completion—a departure from the casing practice employed on the discovery well, where the conductor pipe was 20-in. and the surface string was 13⅜-in. pipe.

The field was discovered on September 1, 1949, by Atlantic and Tide Water 1 State Tract 436, located 8 miles southwest of Port Aransas. The discovery well was originally drilled to a total depth of 7,893 ft. and was plugged back and completed through casing perforations from 6,818-32 ft. and 6,858-68 ft. Initial open-flow potential was 19,000 M.c.f. per day with a gas-oil ratio of 75,000 to 1, and distillate gravity of 57.3°.

The first oil-well completion was finaled on February 4 at Atlantic Refining Co. 1 State Tract 409. Drilled to 8,000 ft., it was plugged back to 7,338 ft. and gun-perforated with 60 shots from 7,311-21 ft. It drew an official state potential of 240.58 bbl. of 39.9°-gravity oil on a 10/64-in. choke with a gas-oil ratio of 744 to 1.

Publicity Venture

Houston teachers told how oil, gas business operates

Leigh S. McCaslin, Jr.

HOUSTON.—In a unique public-relations venture, "top brass" from the oil and gas industry took a day off last week from the regular routine of business to show Houston school-teachers how the industry functions.

The oil men were participating in Business-Industry-Education Day, a joint project of the Houston Chamber of Commerce and the Houston Independent School District. Over 3,000 school-teachers and administrators took airplane rides, boat trips, train rides, and toured facilities of nearly 300 businesses and industries of all types.

The B-I-E program was divided into three phases. First, 5,000 school-teachers, parents, and business men attended an evening "kick-off" program in one of the city's stadiums to hear addresses by Dr. Alexander J. Stoddard, superintendent of Los Angeles public schools, and Eric A. Johnston, president of the Motion Picture Association of America.

For the second phase, all schools were closed while the teachers spent a day as the guests of the executives of business and industry. In the morning, the teachers toured plants, stores, and offices. In the afternoon, panel discussions were held between teachers and executives on the many phases of American business and industry.

For the final phase of the program, the business and industrial leaders accepted the hospitality of the teachers and visited the city's schools.

Annual affair.—Sponsors of the program, impressed by the enthusiasm shown by all participants, are already talking of making B-I-E day an annual affair. Oil-company public-relations men are strongly impressed with the program and compare it favorably with Oil Progress Week.

The importance of the program was well expressed by Charles A. Hall of Hughes Tool Co. who said: "The future of America is in the hands of the teachers of America. Business executives can well afford to invest a great deal of their time in cultivating the friendship and confidence of the school-teachers of America."

The Houston project is the largest ever carried on in the South and the first to be held in a major oil center. The idea was originated right after World War II by Prof. Carl Horn of Michigan State College. It was soon adopted by the education committee of the Chamber of Commerce of the United States. Most of the 50 B-I-E days which have been held have been in the Middle West cities in Michigan, Illinois, Wisconsin, and Pennsylvania.

Participants.—Oil and gas-industry firms who participated in the Houston program include: Gulf Oil Corp., Humble Oil & Refining Co., The Texas Co., Sinclair Refining Co., Stanolind Oil & Gas Co., Shell Oil Co., Tennessee Gas Transmission Co., Houston Natural Gas Corp., United Gas Corp., A-1 Bit & Tool Co., Armco Steel Corp., Baash-Ross Tool Co., Emsco Derrick & Equipment Co., Gray Tool Co., Hughes Tool Co., Kinzbach Tool Co., National Supply Co., Oil Center Tool Co., Reed Roller Bit Co., Schlumberger Well Surveying

Paul Weaver, chief geophysicist for Gulf Oil Corp. in Houston, explains a pumping unit to four "schoolmarms" during Business-Industry-Education Day last week. Various oil companies, including Shell Oil Co., Humble Oil & Refining Co., and The Texas Co., participated in the public-relations venture of explaining business operations to teachers and parents. It may become an annual affair in the Gulf Coast city.

Corp., A. O. Smith Corp., Southwestern Steel Products Co., and Well Equipment Manufacturing Corp.

The oil and gas firms participating in the program received many favorable reactions from Houston's teachers. "Thank you" letters and warm invitations to visit schools flowed in from the 3,000 teachers. One major oil firm which gave its teacher guests a list of company films has been flooded with requests to show the pictures to various student groups. To more accurately evaluate the benefits of the project, a detailed questionnaire is being sent to all the teachers for comments and suggestions.

Various sized groups of teachers were formed for the visits to industries and businesses. Southern Pacific Lines, which took 250 teachers, entertained the largest group. One small retail merchant entertained a single teacher. The average-size group for the activities was 20 persons.

WEST COAST

Coalinga Nose Unit

One of California's largest unitized pressure-maintenance projects, it will be in full operation by the first of the year

D. H. Stormont

LOS ANGELES.—One of California's largest unitized pressure-maintenance projects is expected to reach full-scale operations before the first of the year. The project, the Coalinga Nose unit in Fresno County, comprises 154 wells on 3,030 acres. Current daily output is about 38,500 bbl. of crude and 20,000 M.c.f. of gas. Of the latter about 7,500 M.c.f. daily is being injected; when additional compressor facilities are completed, all residue gas will be returned to the producing formation.

Unitized last March 1 with gas injection started on April 20, the seven-company operation is being handled by Los Nietos Co., a wholly owned Union Oil Co. subsidiary. Other companies involved are Standard Oil Co. of California, Superior Oil Co., The Texas Co., Honolulu Oil Corp., Seaboard Oil Co., and McAlester California Oil Co.

Union purchase.—Union came into the picture about a year ago when it purchased Los Nietos Co. and made a long-term crude-purchasing agreement with McAlester. Each of these companies, along with Honolulu and Seaboard, owned a quarter interest in 1,325 acres of productive Coalinga acreage.

These two deals, which resulted in Union gaining control over 27.8 per cent of what is now unit production, made it the largest participator in the project. Standard, with 22.6 per cent, is the next largest. Interests of the other participants are: Superior, 17 per cent; Seaboard and Honolulu, each 13.9 per cent; and Texaco, 4.8 per cent.

Less producers. — Following unitization the number of producers in the fully developed field has been reduced from 154 to less than 100. Those shut in primarily were high-ratio wells; their closure resulted in the average ratio being reduced from 870 to about 520 cu. ft. per barrel. All but two of the wells currently on production are either flowing or on gas lift.

Since taking over as unit operator, Union has been engaged in consolidating separators, tank batteries, and other facilities. In place of the tankage required in the former seven-company operations, under unit operation there will be only two central-storage and shipping stations in the 4½-mile-long field. The field's gas-gathering system also is being revised to provide for stage separation of gas at 250, 100, and 10 psi.

Gasoline plant.—At the unit absorption-type natural-gasoline plant, two additional 650-hp. compressors are being installed to handle the stepped-up injection operations. All residue gas in excess of plant and field requirements will be desulfurized and dehydrated, and then returned to the 7,850-ft. main Gatchell sand at about 1,700 psi. Gas will be injected through wells situated well up in the gas-cap area.

Discovered in May 1938, Coalinga Nose to date has produced about 164,000,000 bbl. of crude, practically all of which came from the reservoir within the unit area. A stratigraphic-type reservoir, the producing-sand thickness varies from a maximum of 700 ft. near the center down to a feather edge outside the border of the unit boundary.

Spacing Law Is Upheld

SACRAMENTO. — California's Supreme Court last week reversed an Appellate Court decision of last June and declared that the state's well-spacing law was constitutional.

The decision was rendered in the case of John C. Hunter vs. Justice Court of Centinela Township. Hunter owns two lots in the Athens area which total 0.39 acre and did not wish to have his properties included in a community lease which Shell Oil Co. held. Despite the California code which prohibits drilling on leases of less than 1 acre, he had started a well on his property.

The lower court held that the well-spacing law deprived him of his rights to recover his fair share of oil from the reservoir and that his property rights had been invaded. The Supreme Court, in reversing the decision, held that the two sections of the public-resources code involved, Sections 3600 and 3608, were constitutional.

These two sections, in addition to the well-density provision, provide that the operator of a community lease shall pay royalties to property owners within the area although the owners have not leased their land to the operator.

The decision therefore is of importance because of the implication that due process of law does not require the legislature to give the landowner the option of participating as a producer.

World Crude Production

Output exceeded 11,000,000 bbl. daily in September; nearly all major producing areas registered increases

Dahl M. Duff

ANOTHER month of new records in crude-oil production in many countries, including the United States, brought total world output well above the 11,000,000-bbl. mark in September.

Most of the increase of 251,000 bbl. daily over August was accounted for by the all-time high in output in the United States. In many foreign areas, small gains were made in September above the previous record production levels established during the summer.

The month of September thus continued the remarkably sharp upward trend in world production that has taken place throughout this year. There has been a succession of new records since last spring.

The United States, which still produces more than half the world's total crude supply, has shown a production rise from 4,878,000 bbl. daily last March to the 5,901,000 bbl. daily preliminary total for September. The September production in this country represented an increase of nearly 237,000 bbl. daily, or more than 4 per cent, over August.

Output up.—Major foreign producing areas, except for Iran, reported further gains in output in September. New records were established in Canada, Venezuela, Colombia, Saudi Arabia, Iraq, and Kuwait. As a result, total foreign production, excluding Russia and its Eastern European satellites, was up some 14,000 bbl. daily to reach a new record high at 4,288,000 bbl. daily.

The increase of 251,000 bbl. daily in world production from August to September brought the total, including the estimated Russian-controlled areas, to 11,073,000 bbl. daily. This figure represented an increase of 2.5 per cent over August and compares with the 2.5 increase from July to August.

As against September 1949, production in September of this year was up 18.5 per cent for the world as a whole; 19.4 per cent for the United States; and 20 per cent for all foreign areas less those Russian-controlled. The reports show that all areas, foreign as well as the United States, are now producing some 1,731,000 bbl. daily more of crude than they were a year ago.

All-out effort.—The virtually all-out production effort of the industry has caused some of the industry's leading economists to revise upward their estimates of requirements over the next year or two. Production, of course, reflects demand, and while some of the increased amounts of crude are going into industry and government stocks, by far the larger part of it appears to be taken in immediate consumption. While there are no complete or accurate figures on world storage, it has been pointed out that no storage or stock increases could

WORLD CRUDE-OIL PRODUCTION
(Thousands of barrels daily)

Country—	Sept. 1950	August 1950	Sept. 1949
Western Hemisphere:			
Argentina	63.0	60.0	66.7
Bolivia	1.4	1.6	1.4
Brazil	1.5	0.7	0.2
Canada	89.8	78.6	71.2
Chile	1.5	1.5	....
Colombia	97.9	94.7	84.2
Cuba	0.2	0.2	0.3
Ecuador	7.1	7.1	7.1
Mexico	195.0	193.5	170.3
Peru	40.0	40.0	40.1
Trinidad	56.4	56.0	57.0
Venezuela	1,586.0	1,563.9	1,426.5
Total	2,139.8	2,097.8	1,925.6
Europe and Africa:			
France	3.2	3.2	1.3
French Morocco	0.9	0.8	0.3
Germany	22.5	22.6	17.6
Italy	0.2	0.2	0.2
Netherlands	13.5	13.4	12.5
Egypt	45.2	44.5	44.1
United Kingdom	0.9	0.9	0.9
Total	86.4	85.6	76.9
Middle East:			
Bahrein	31.1	30.7	29.8
Iran	611.0	692.0	554.1
Iraq	160.8	134.2	108.0
Kuwait	368.8	354.0	247.4
Qatar	36.4	42.0	....
Saudi Arabia	594.8	585.8	412.2
Turkey	0.8	0.8	0.4
Total	1,803.7	1,839.5	1,351.9
Other Asia:			
British Borneo	84.0	82.0	75.0
Burma	1.8	1.8	0.6
China	2.0	2.0	1.5
India	5.2	5.2	5.3
Indonesia	150.0	145.0	124.7
Japan	6.2	6.0	4.0
New Guinea	4.8	4.8	4.8
Pakistan	4.0	3.9	2.2
Total	2,580.0	250.7	218.1
Total, foreign less Russia and E. Europe	4,287.9	4,273.6	3,572.5
Estimated Russia and Eastern Europe:			
Austria	25.0	25.0	20.0
Romania	85.0	85.0	90.0
Russia	750.0	750.0	700.0
Other E. Europe	24.1	23.6	19.0
Total	884.1	883.6	829.0
Total, foreign	5,172.0	5,157.2	4,401.5
United States	5,901.0	5,664.3	4,940.2
World total	11,073.0	10,821.5	9,341.7

Figures are from reliable reports in the industry or from official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on production in these areas.

possibly account for the major part of the recent production increases.

Russia's state oil industry seems to be sharing in these general gains in crude output. Recently the Soviets have given indications of their current production level. In a speech in Moscow on the anniversary of the Red revolution, Marshal Nikolai Bulganin, deputy premier, said oil production for the first 10 months of this year was 21 per cent over the 1940 level.

Taking the 1940 average production at 610,000 bbl. daily, this indicates that Russian production during the period was about 740,000 bbl. daily, a figure which is in general conformity with other estimates. The Russians had set a somewhat modest goal of 14 per cent above 1940 for this year. This goal, corresponding to about 700,000 bbl. daily, is reported to have been reached in the last quarter of 1949.

Western Hemisphere.—In the Western Hemisphere, Venezuela during September showed a small increase in output to exceed its previous high of 1,572,000 bbl. daily in June. The September daily average was 1,586,000 bbl., representing a gain of about 1.4 per cent over August. Venezuelan

VENEZUELAN PRODUCTION BY MAJOR FIELDS
(More than 10,000 bbl. daily)

Field—	September 1950	August 1950
Eastern Venezuela:		
Quiriquire	73,622	71,428
Oficina	51,047	50,906
Jusepin	25,976	25,778
Mulata	17,862	18,288
Nipa	43,400	47,663
Las Mercedes	17,918	17,892
Santa Barbara	17,876	18,590
Guico	11,195	12,455
Guara	59,779	59,468
Chimiri	49,459	42,618
Western Venezuela:		
Cabimas	82,453	73,430
Lagunillas	395,416	400,440
Tia Juana	166,073	162,114
La Paz	166,005	165,023
Sibucara	9,720	10,327
Bachaquero	127,466	111,447
Mene Grande	46,730	46,297
El Cubo	12,329	12,691
Mara	83,876	88,585
Boscan	17,157	18,428

production in September was 11.2 per cent above September 1949. Weekly production figures from Venezuela covering September of this year were: week ended September 4, 1,577,456 bbl. daily; September 11, 1,593,253 bbl. daily; September 18, 1,587,501 bbl. daily; September 25, 1,577,527 bbl. daily; and October 2, 1,578,394 bbl. daily.

Canada up.—The marked rise in production in Canada in September was due in large part to the accumulation of crude for the opening in the latter part of the month of the initial section of the Edmonton-Superior, Wis., crude line. Full operation of this line providing the first eastern outlet to prairie production will be reflected in further gains in coming months. Colombia's output in September was slightly above the previous record set in July. These increases are due to the additional capacity installed on the Andian National line from De Mares to the coast. Production by concession in Colombia during September was: De Mares, 1,074,963 bbl.; Casabe, 936,527 bbl.; Barco, 770,656 bbl.; El Dificil, 86,770 bbl.; Cantagallo, 35,710 bbl.; and Velasquez, 32,303 bbl.; total 2,936,929 bbl.

Production from Brazil's small fields in the Bahia area rose to 1,500 bbl. daily, or double the previous month. This was the result of preparations for the opening of the new 2,500-bbl. daily refinery built by the government's Conselho Nacional do Petroleo. Production in Mexico continues around the 200,000 bbl. daily mark.

Germany.—Germany's production, now running at its highest level since before the war, continued at about 22,500 bbl. daily. The September total, in metric tons, was 95,387. Of this, 42,599 tons came from Emsland; 42,574 tons from Hanover; 9,756 tons from Schleswig Holstein - Hamburg; and 458 tons from Baden. Development of the new field at Lacq in southern France has brought France's small domestic production to a level nearly three times above what it was a year ago.

Middle East.—Of the major Middle East producing countries, Iran was the only one to show a decrease in September. In this country, output was down from approximately 692,000 bbl. daily in August to 611,000 bbl. daily in September. With added capacity on the pipe lines to Tripoli, Iraq's production from Kirkuk field was increased to more than 150,000 bbl. daily, highest in the country's history. Saudi Arabia also established a new record at 594,800 bbl. daily, partly as a result of production to fill the newly completed Trans-Arabian line to the Eastern Mediterranean. A small gain was made in Kuwait's production, bringing the daily average of 368,800 bbl., all from the single Burghan field. With the lower output of Iran, production in the Middle East as a whole was down about 36,000 bbl. daily.

Information made available on production in Indonesia during earlier months of this year indicates September production to be approximately 150,000 bbl. daily, or possibly higher. Output in January was about 110,000 bbl. daily, exclusive of Western New Guinea, and this had risen to above 145,000 bbl. daily by July

TREND OVER THE LAST YEAR

1949—	Western Hemisphere less United States	Middle East	Total foreign less Russia & E. Europe
October	1,921.6	1,428.6	3,645.0
November	1,925.9	1,472.7	3,683.0
December	1,929.3	1,489.6	3,711.0
1950—			
January	1,946.5	1,491.4	3,733.4
February	1,820.6	1,566.6	3,689.4
March	1,900.4	1,607.4	3,812.9
April	1,968.2	1,639.5	3,918.3
May	1,775.4	1,752.0	3,847.4
June	2,098.2	1,811.5	4,229.6
July	2,073.2	1,808.3	4,202.6
August	2,097.8	1,839.5	4,273.6
September	2,139.8	1,803.7	4,287.9

LATIN AMERICA

Brazilian Refinery

Work started at Santos site; pipe lines planned

THE cornerstone for the new 45,000-bbl.-daily refinery being built by Brazil's Conselho Nacional do Petroleo at Cubatao near Santos was laid recently by the retiring President Dutra at a ceremony attended by civic and military leaders.

Foundation work is now under way on the 4,500-acre site, and construction of the process section and other facilities is expected to begin shortly after the first of the year. Hydrocarbon Research, Inc., has the contract for design, engineering, and supervision of construction.

Equipment at the plant will include reforming and thermal cracking, visbreaking, and catalytic polymerization. Anticipated annual production is: aviation gasoline, 118,000,000 liters; motor gasoline, 1,000,000,000 liters; kerosine, 234,000,000 liters; L.P.G. (propane), 44,000 tons; diesel oil, 203,000 tons; and fuel oil, 570,000 tons.

Pipe lines.—Plans for an entire system of pipe lines to be eventually built in the state of Sao Paulo have been outlined by Renato Feio, director of the Santos Jundiai government railroad. This railroad is now preparing to lay two lines from Alemca (Santos) to Utinga (Sao Paulo County). These 48-km. lines will consist of one 10-in. for the movement of light products and a second of 18-in to transport fuel oil. The 10-in. lines are to be laid from Alemca to Cubatao, the new refinery location.

Another pipe line, about 110 km., is being planned between Campinas and Sao Bernardo, the railroad director said. This 6-in. line would move about 20,000 bbl. daily of light products. Branch lines planned include two 6-in. for light products and one 14-in for heavy products from Utinga to Mooca. Another branch from Cais de Valongo (Santos) to the Cubatao refinery will have a 20 or 24-in. line for crude and two 10-in. lines for light products. Still another line in

the planning stage would supply the Refinaria Uniao, to be built in Sao Paulo City.

British deal.—The Brazilian and British governments early this month concluded a trade agreement providing for the reciprocal exchange of goods and materials between the two countries. Oil was the largest single item specified for import into Brazil by the British under the agreement. The sterling oil imports by Brazil will amount to £11,460,000 for the year's period.

The agreement was said to confirm previous British shipments of oil into Brazil, and unlike last year's British-Argentine trade agreement, to represent no loss of market for American companies. Shell is the British company now marketing in Brazil, and the imports of oil under the agreement appear to be in line with its existing trade in the country.

Pemex Buying Mexican Gulf

Petroleos Mexicanos, Mexican Government oil agency, has been negotiating to buy the remaining stock of Mexican Gulf Oil Co., a Gulf Oil Corp. subsidiary.

Reports in Mexico City said the transaction had actually taken place but it was learned that, although discussions have taken place, the purchase has not yet been finalized.

Mexican Gulf was one of several companies not included in the 1938 expropriation order. The company has terminal facilities, some transportation equipment, and production in the northern and south zones of the country. Latest reports as of June showed this production to be about 14,000 bbl. daily, mostly in northern Mexico.

In 1940, Pemex arranged to buy 40 per cent of the stock of the company, and the present deal is aimed at acquisition of the remaining interest of Gulf. According to the Mexico City report, Pemex is paying between Ps 5,000,000 and 10,000,000 ($550,000 to $1,100,000) for the properties.

Pemex's efforts to acquire the remaining private oil property in Mexico resulted last week in an announcement in Mexico City by the agency that it had purchased the property and royalty rights held by Abraham Z. Phillips and family in the vicinity of Pozca Rica field.

Phillips, a naturalized Mexican who acquired the properties shortly before the 1938 expropriation order that took over nearly all foreign oil holdings, has been negotiating for more than 3 years with Pemex over a settlement. Under the purchase announced by Sen. Antonio Bermudez, Pemex director, the Phillips interests will receive $2,500,000 for all their property, taking monthly payments of $100,000 each for the next 25 months.

It was reported in Mexico City that with the settlement of this claim, the only remaining property to be bought was that of Mexican Gulf and that an agreement on this was expected to be announced in the near future.

Peru May Change Oil Law

WASHINGTON. — Possibilities of modification of Peruvian laws which have effectively barred any development of that country's oil resources by American operators are seen here as the result of recent discussions in Lima between a Peruvian commission and representatives of three oil companies.

Legislation which would open Peru to development by foreign capital has been sought over a long period but against opposition which made its enactment impossible.

As a result of the recent conferences, however, it is believed the way may have been cleared for consideration of the matter by the Peruvian Congress and there are suggestions that President Odria may call a special session for that purpose.

EUROPE

Po Monopoly Questioned

The Associazione Minerari Italiana (Italian Mining Association), has clarified its position towards the proposed new mining law which would reserve to the Italian Government oil organization (AGIP) a monopoly on further oil exploration and production in the Po Valley.

The AMI pointed out to the Italian Government the convenience for that country, which lacks capital and has a limited and only recent experience in the field of hydrocarbon research, not to ostracize foreign capital and foreign companies with a long and extensive experience in an activity which requires considerable expenses and investments and is characterized by a rather high risk.

The statement was made for the association by Federico Squarzina, secretary general, who said that the association has never pointed out to the Italian Government or to ministerial offices concerned the danger of retaliations on the part of the United States Government or of American private parties.

Squarzina referred to an earlier report that the Italian Mining Association had protested to Premier De Gasperi and the Italian minister for foreign trade on a new mining law which would create a state oil monopoly on further oil exploration and production in the Po Valley. *(The Oil and Gas Journal, January 19, 1950, page 37.)*

MIDDLE EAST

Dispute to British Courts

The dispute between Iraq Petroleum Co., Ltd., and the Iraq Government over whether royalty should be paid on the basis of the free or the official gold rate is being placed before courts in Britain.

Dr. Nadim Al-Pachachi, director of the Iraqi Ministry of Economics, accompanied by a delegation of oil experts and legal advisers, left Bagdag recently for London in connection with the suit being instituted to settle the disagreement.

Iraq Petroleum officials reached a settlement with the government in August for a 50 per cent increase in royalty payment and at the time the government said it would sue in British courts on the gold question. The official buying rate for gold (248 shillings per fine ounce) is equivalent to about $8.17 per gold sovereign, thus giving a royalty rate of about 32.3 cents a barrel at six shillings per ton. In addition, the company pays 1½ to 2 cents in lieu of taxes.

The free market gold price in the Middle East ranges around $12 an ounce. The question involves only I.P.C. itself and not the Basrah and Mosul associated companies.

Iraq Line Pipe Arrives

The first shipment of pipe for the 30-in. crude-oil line which will treble current deliveries of Kirkuk crude to the Mediterranean, has arrived in Tripoli from the United States.

The Iraq Petroleum Co., Ltd., pipe line will have a capacity of 13,000,000 metric tons annually (97,500,000 bbl.) and will connect Kirkuk field in northern Iraq with the Mediterranean seaboard at Banias. It will be 560 miles long and will require 145,000 tons of 30 and 32-in. pipe, and 23,000 tons of 26-in. pipe. Consolidated Western Steel Corp., Los Angeles, and National Tube Co., Lorain, Ohio, are supplying the pipe, as there is an inadequate European capacity for 30-in. pipe. Pumping facilities are being ordered from the United Kingdom.

Arrangements have been made with Furness Withy & Co. for charter of 42 ships for transporting the pipe from the United States to Tripoli and to Basrah on the Persian Gulf.

The first cargo of pipe, which left Baltimore October 14, consisted of 3,224 tons, or 13.4 miles, of 26-in. It will be used for the downhill gradients from the saddle of the Homs Gap to the seacoast at Banias. First cargo of 30-32-in. pipe left Los Angeles September 30.

When the new line is completed in 1953 more than 18,000,000 metric tons annually (135,000,000 bbl.) of Iraq crude will flow to the Mediterranean for markets in western Europe.

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PERSONALS

Veteran Refiner

Clark has been with Utah Oil Refining since 1922

ROBERT G. CLARK, a director of Utah Oil Refining Co. and manager of the 25,000-bbl.-per-day refinery at Salt Lake City, has a background of 28 years' service with the firm.

A native of Cheyenne, Wyo., Clark graduated from Cornell University in 1922 with a mechanical-engineering degree. He joined Utah Oil the same year as an engineer at the Salt Lake refinery, and was named chief engineer the following year. He held this position until October 1949, when he assumed the position of refinery manager. In April 1950, he was elected a director of the corporation.

During 1942-45 he was associated with the design, construction, and operation of the $15,000,000 aviation-gasoline plant (DPC Plancor 1,164) at Salt Lake City. At the end of World War II he assisted in the negotiations for the purchase of this plant by his employer, which resulted in the first purchase of a wartime aviation-gasoline plant by a private corporation.

Carl S. Oldach, technical superintendent for E. I. du Pont de Nemours & Co., Inc., has been transferred from Wilmington, Tex., to Victoria, Tex.

Guy B. Simmons, tool pusher for Big Chief Drilling Co., has been transferred from Plains to Odessa, Tex.

Donald M. Murphree, geologist formerly located at Houston, has moved to Dallas where he has opened an independent consulting and exploration office.

N. J. Lea, seismologist party chief for The Texas Co. at Coalinga, Calif., has been transferred to the Pacific Coast division's Los Angeles office where he will review and interpret seismic data.

D. A. Howard, formerly vice president of Republic Natural Gas Co., Dallas, has opened an office there to practice oil law and engage in engineering-consulting work. He will not operate from Oklahoma City as he previously announced.

W. H. Pattison, Deep Rock Oil Corp., Kansas area manager, has announced his resignation effective December 1. He plans to enter the independent field in Kansas and the Rocky Mountain area.

J. B. Moore, Jr., schedule engineer for Fish Construction Co. at Salisbury, N. C., has joined Plantation Pipe Line Co. at Anderson, S. C., as division engineer.

Milton S. Beringer, vice president in charge of manufacturing for British American Oil Co., Ltd., has been appointed to the board of directors. He joined British American in 1934 as a refinery superintendent, and was made vice president in 1945.

James B. Hall, formerly safety supervisor in the production and transportation department of Equitable Gas Co., has been appointed manager of accident prevention for the company and its affiliated gas and oil companies. Hall joined Equitable Gas in 1937 as a cadet engineer.

A. H. Bell, president of the West Coast drilling-contracting firm of Bell & Burden, Inc., Los Angeles, was elected president of the California chapter of American Association of Oilwell Drilling Contractors succeeding **W. W. Cline,** president of San Joaquin Drilling Co., Los Angeles. **A. H. Heiser,** of Brown Drilling Co., Long Beach, was chosen as vice chairman for southern California, and **Harvey Davis,** of Crown Drilling Co., Bakersfield, was selected as vice president for the San Joaquin Valley. **Lee Daniels,** of Loffland Brothers Co., Los Angeles, was reelected secretary.

Stanley D. Smith, geologist with Skelly Oil Co. in Midland, Tex., has joined the geological staff of American Trading & Production Corp., Midland. Those who have joined American's geological staff at Abilene, Tex., include: **William H. Eckes,** geologist formerly with Skelly Oil Co. in Midland; **Arthur W. Neff,** geologist formerly with Amerada Petroleum Corp. in Midland; and **Charles D. Grant,** geologist, recent graduate of the University of Oklahoma.

Richard K. Epps, Jr., geologist and petroleum engineer for Hycalog Co., has been transferred from Jasper, Tex., to Houston.

John H. DeFord has resigned as division geologist for Bay Petroleum Corp. and will work as a consulting geologist and independent oil operator at Midland, Tex.

Dr. Bernard H. Shoemaker, divisional director of research for Standard Oil Co. (Ind.), at Whiting, has been elected chairman of the American Chemical Society's division of petroleum chemistry, succeeding **Dr. A. A. O'Kelly,** technical director for Alox Corp., Niagara Falls, N. Y. Dr. Shoemaker joined Indiana Standard in 1930 after receiving his Ph.D. degree from Ohio State University.

Harry J. Burns has been appointed senior resident engineer in Mexico for the Perco division of Phillips Petroleum Co., and will represent Perco's licensing and engineering services in the various refineries of Petroleos Mexicanos. Burns joined the refining department of Phillips in 1932; was named superintendent of manufacturing at the Kansas City, Kans., refinery the same year, and in 1945 was transferred to Mexico City as Phillips operation supervisor under the firm's petroleum supervisory contract with the Mexican Government.

Dr. S. W. Martin has been appointed general manager of the engineering and development department of Great Lakes Carbon Corp., Chicago. He joined the firm in 1949 as associate director of research, and in his new position will be responsible for the research, development, and engineering activities of the corporation.

J. B. Thompson, production superintendent for General American Oil Co. of Texas, has been transferred from Thibodaux, La., to Gladewater, Tex., as supervisor of properties in the East Texas district.

Edmund D. Wingfield, vice president of Freeport Sulphur Co., New Orleans, has been elected to the company's board of directors, and **Emmett H. McFarland,** general manager, and

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PERSONALS

Robert C. Hills, director of developments, have been elected vice presidents.

Everett B. Miller, geophysical supervisor for Continental Oil Co. at San Antonio, has been transferred to Houston as area geophysicist.

Robert R. Shaffer, formerly engineer for Stanolind Oil & Gas Co. at Levelland, Tex., has joined Ohio Oil Co. at Bakersfield, Calif., as petroleum engineer.

D. E. Burroughs, vice president of the American Petroleum Credit Association and general credit manager of Shell Oil Co., New York City, has been elected president of the organization succeeding **Arch E. Fletcher,** general credit manager for Standard Oil Co. (Ohio), Cleveland.

L. S. Melzer, formerly with the geological department of Stanolind Oil & Gas Co., has joined Hancock Oil Co. as geologist at the new Mid-Continent headquarters in Midland, Tex.

James R. Cotton, formerly geologist for Pure Oil Co., has joined the Midland geological department of Houston Oil Co. of Texas.

Joseph E. Raskaskas, Bartlesville, Okla., has been named Kansas district geologist for Cities Service Oil Co., succeeding **W. Vernon Hess** at Wichita who has resigned to enter consulting practice.

Hayward H. Hill, petroleum engineer with Stanolind Oil & Gas Co., has been transferred from Andrews to Midland, Tex.

I. W. Hartman, Mount Pleasant independent oil producer, was elected president of the Oil & Gas Association of Michigan at the annual election of the board of directors in Lansing. He succeeds **James Foster,** Socony-Vacuum Oil Co., Inc., Detroit, who served as president for 2 years. Directors elected **J. V. Wicklund,** Detroit producer, as vice president for 1951. **William Palmer,** executive secretary, was also elected secretary in a consolidation of the two offices. **O. H. Kristofferson,** Mount Pleasant consulting geologist, and **Kurt de Cousser,** Socony-Vacuum, will continue as cotreasurers. **Arthur H. Ledbetter,** Mount Pleasant, and **W. B. Pardoe,** Grand Rapids, Mich., were elected life members of the association in a special honorary action for their services as past secretaries. **Dewey L. Province,** Ohio Oil Co., and **Harold McClure, Jr.,** McClure Drilling Co., were elected to fill vacancies on the board.

D. A. Jerome, of the land department of Cities Service Oil Co.'s Permian basin district office in Midland, Tex., has resigned and will work there as an independent oil operator.

John W. McKee, Toronto, a director of Canadian Oil Co., Ltd., and Canadian Oil Refineries, Ltd., and chairman of Stone & Webster Canada, Ltd., has been elected to the board of directors of Stone & Webster, Inc.

J. D. Meador, foreman for Republic Pipe Line Co. at Benavides, Tex., has been transferred to Eldorado, Tex., in the same capacity.

Louis C. Bodemann, Jr., engineer for British-American Oil Producing Co., has been transferred from Sweetwater, Tex., to Tulsa.

P. K. Kuhne, assistant to the general manager of Gulf Oil Corp.'s manufacturing department, Pittsburgh, has been assigned the additional duties of assisting in the administration of the department's technical division.

F. Gayle Hawk has been appointed regional purchasing stores manager, Shell Oil Co., Houston. Other transfers include: **W. C. Abbott,** geophysicist assistant, from regional exploration department, to Houston as seismologist assistant; **J. R. Castano,** junior geologist, from West of the Rockies region to the geological department, Exploration and Research Laboratory, Houston; **G. H. Embry,** drilling foreman from Premont, to Eagle Lake, Tex., in a similar capacity; **T. S. Haywood,** district superintendent, from Premont to Corpus Christi, Tex.; **J. M. Palmer,** exploitation engineer, named to division production engineer, Houston; **C. F. Martin,** exploitation engineer, from the Midland area to the Houston regional office; **G. L. Scheirman,** junior exploitation engineer, from the Houston regional office to the Houston area as exploitation engineer; **W. R. Lund,** chief exploitation engineer from Houston area to the regional production department as exploitation engineer; and **L. J. Hubka, Jr.,** junior geologist, from regional office to the Houston area as subsurface geologist. **Dr. J. W. Handin,** geologist, has joined Shell's exploration and production lab at Houston; and **J. L. Ward,** junior mechanical engineer, has joined the Houston area production department.

John Searl has been named supervisor of the power plant and auxiliary operations at Tide Water Associated Oil Co.'s Bayonne, N. J., refinery, succeeding **George Gast** who recently retired.

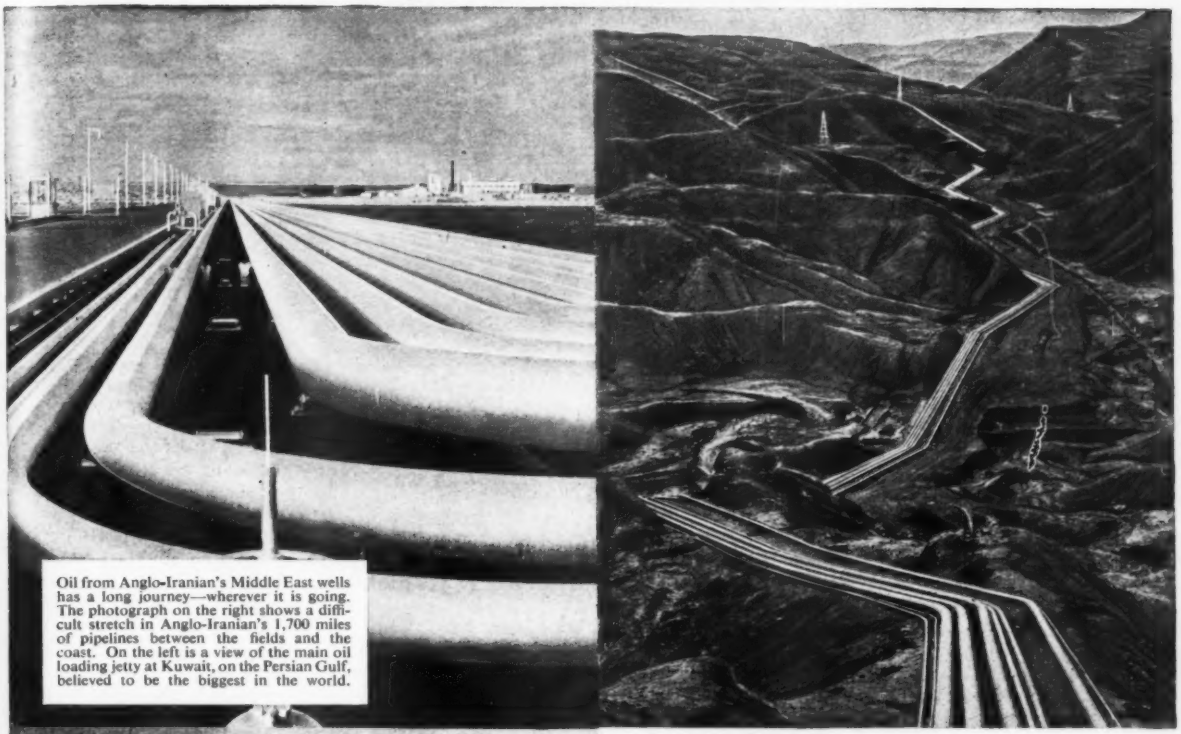
Charles C. Runyan has been named assistant manager of the Mississippi division of Pan-Am Southern Corp.

Evan Griffiths, Northern Natural Gas Co., has been named to the new field position of assistant superintendent of the compressor station at Beatrice, Neb., and **Roy Spratt** has been appointed assistant superintendent of the compressor station at Palmyra, Neb.

A. C. Poulk, division "A" superintendent for Tennessee Gas Transmission Co., Victoria, Tex., has been named assistant pipe-line superintendent at Houston. **Frank H. Smith,** safety engineer, succeeds Poulk at Victoria, and **Ray L. Davis,** formerly

***HOUSTON NOMADS VISITORS.**—Visitors at the November meeting of the Houston Chapter of Nomads included, left to right: Bill Lewis, Petroleum Industry Consultants, Caracas, Venezuela; J. M. Ribble, Phillips Petroleum Co., Bartlesville, Okla.; Jess C. George, Socony-Vacuum Oil Co., Inc., Caracas; C. B. Caldwell, Harrisburg Sales & Service Co., Houston; and George E. Greiner, Phillips Petroleum Co., Bartlesville.*

Piped Aboard!



Oil from Anglo-Iranian's Middle East wells has a long journey—wherever it is going. The photograph on the right shows a difficult stretch in Anglo-Iranian's 1,700 miles of pipelines between the fields and the coast. On the left is a view of the main oil loading jetty at Kuwait, on the Persian Gulf, believed to be the biggest in the world.

Some 14 per cent. of the world's tanker tonnage is directly employed in Anglo-Iranian's trade. Anglo-Iranian's own tanker fleet, operated by the British Tanker Company, comprises 134 ships totalling 1,600,000 d.w. tons, and the Company has vessels under charter to the extent of a further 2,000,000 tons.

First and Biggest

oil producers in the Middle East since 1912, Anglo-Iranian Oil Company and its associated companies also operate twelve refineries in Europe, Middle East and Australia; their sales organisation includes major marketing or supply interests in Europe, Asia, Africa and Australasia, with international ships' bunkering and aviation services.

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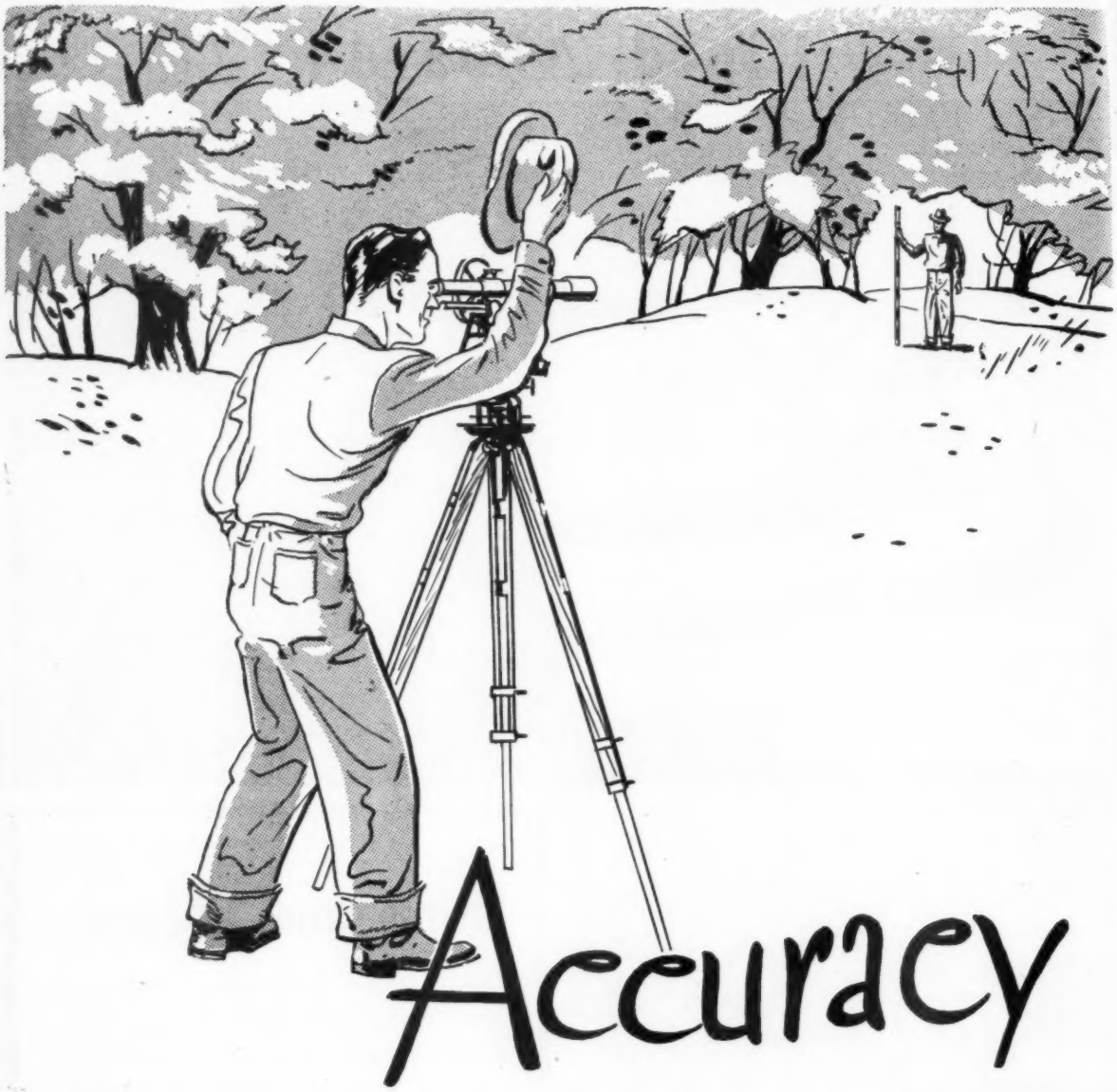

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PERSONALS

at Kenova, W. Va., has been transferred to Houston as assistant gas-measurement superintendent.

DON EMERY

Don Emery, a member of the board of directors, the executive committee, and vice president and general counsel of Phillips Petroleum Co., Bartlesville, Okla., has resigned his position as executive committee member and vice president and general counsel, effective December 31, to enter the private practice of law in Oklahoma City. He will continue to serve as a member of the board of directors of American Independent Oil Co. **Rayburn L. Foster,** assistant general counsel, was elected vice president and general counsel of Phillips succeeding Emery. Foster has been with the firm over 22 years, and was elected assistant general counsel in 1944.

Roy E. Carter, Kermit, Tex., was named chairman of the Permian Basin chapter of the American Petroleum Institute. Other officers elected were: **Early N. Spiars,** of Midland, Tex., reelected vice chairman; **Dean A. Chase,** of Odessa, Tex., second vice president; and **John E. Cooper,** of Midland, third vice president.

Dr. Harold R. Snow, vice president and manager of Pan-American Refining Corp., Texas City, Tex., has been named a director of the Texas City National Bank.

J. N. Wilson has been appointed head of the physics department at Shell Development Co., Emeryville, Calif. He joined Shell in 1943 as a chemist at the Emeryville laboratories, and was named assistant head of the physics department in 1950, the position he occupied until his recent appointment. He is a graduate of the University of British Columbia, and holds a Ph.D. from the California Institute of Technology.

C. A. Reid, tool pusher for Penrod Drilling Co. at Plaquemine, La., has been transferred to El Campo, Tex., in the same capacity.

John Harper, Long Island City, N. Y., recently elected chairman of National Oil Jobbers Council to succeed **John L. Bero,** Duluth, Minn., will replace the latter as an ex officio member of the National Petroleum Council for the remainder of the year.

Donald T. Axon, formerly economic analyst for Carter Oil Co., Tulsa, has accepted a position in the manufacturing and research department of Deep Rock Oil Corp., and will be headquartered in Tulsa.

Howard T. Tellepsen, president of Tellepsen Construction Co., has been elected president of the San Jacinto chapter of the Texas Society of Professional Engineers, Houston. Other new officers include: **Frank H. Newman, Jr.,** partner in the firm Lockwood & Andrews, consulting engineers, and **Fred H. Martin,** vice president of Garrett Engineering Co., vice presidents; **Mark G. Garver,** resident manager of J. E. Greiner Co., Houston, secretary-treasurer; **F. N. Baldwin,** director of utilities department, city of Houston, **Harry E. Bovay, Jr.,** consulting engineer, **Russell L. Jolley,** president of Southwest Steel Products Co., **R. Frank Nowlin,** superintendent of gas measurement, United Gas Corp., and **P. H. Robinson,** assistant vice president, Houston Light & Power Co., directors; and **Noah E. Hull,** plant manager, Hughes Tool Co., state director.

Dean W. R. Woolrich, of University of Texas College of Engineering, Austin, was honored as "outstanding engineer of the year" on November 14 by the Travis chapter, Texas Society of Professional Engineers, at Austin.

R. R. Barr, drilling foreman for Shell Oil Co., has been transferred from Denver City, Tex., to the New Orleans area. Other transfers in the firm include: **B. C. Brown, Jr.,** production foreman, from McCamey to Odessa, Tex.; **B. J. Bullard,** junior mechanical engineer, from Midland, Tex., to the New Orleans area; **C. F. Cogan,** junior mechanical engineer, from the Tulsa area to Midland; **J. A. Connors,** head roustabout, from Hobbs, N. M., to Wasson, Tex.; **C. A. Cox,** head roustabout, Monahans, Tex., to McCamey; **R. B. Cravens,** head roustabout, from McCamey to the Odessa division; **R. E. Farmer,** junior geologist, from Midland to the Houston regional staff; **D. M. Fink,** junior exploitation engineer, from New Orleans area to Midland; **R. F. Gorman,** junior mechanical engineer, from Houston to Hobbs; **A. T. Guernsey,** exploitation engineer, from Midland to Wasson; **W. C. Gussow,** geologist, from Tulsa to Midland; **J. J. Havens,** head roustabout, from Odessa to Monahans; **R. M. Hippard,** exploitation engineer, from Hobbs to Midland; **B. F. Madera,** district exploitation engineer, from Wasson to Odessa; **C. F. Martin,** exploitation engineer, from Odessa to Houston; **J. E. Michaels,** junior mechanical engineer, from Midland to New Orleans; **R. L. Mims,** seismologist, from Calgary, Alta., to Midland; **J. F. Minter,** junior mechanical engineer, from Midland to Houston; **C. L. Rabe,** division exploitation engineer, from Odessa to Midland; **W. A. Scott,** exploitation engineer, from Midland to Hobbs; **C. H. Siebenhausen,** junior mechanical engineer, from Midland to New Orleans; **W. A. Simpson,** head roustabout, Odessa to McCamey; **J. V. Vogel,** junior mechanical engineer, from Tulsa to Midland; and **R. K. Williams,** mechanical engineer, from Hobbs to Eunice, N. M.

DEATHS

J. P. Straughan, retired independent oil operator, died November 18 in San Antonio.

Walter D. Caldwell, 65, an attorney with Gulf Oil Corp. in Houston for 21 years, died November 12 in Houston.

Charles G. Durfee, 51, vice president in charge of engineering for Pyrene Manufacturing Co., Newark, N. J., died November 13 in Los Angeles while attending the A.P.I. meeting. He was also president of Chemical Concentrates, Philadelphia.

Troy Holmes, former production foreman for Shell Oil Co. at Tomball, Tex., died October 11 at Peniel, Tex.

Paul K. Brenner, 42, auditor for The Chicago Corp., Corpus Christi, died November 7.

Walter H. Aspin, 85, pioneer oil drilling contractor, died in Tulsa November 12.

Kenneth K. C. Tomlinson, 58, manager of the San Francisco division of American Meter Co., died November 14 in Los Angeles while attending the A.P.I. meeting.

Maurice W. Tinkle, 48, credit manager of the Houston division of The Texas Co., died November 19.

O. H. Carlisle, 71, retired division manager of Gulf Oil Corp., died November 17 at Houston.

Jules Carl Bertrand, 65, retired oil man and formerly a partner in the firm of Bradford & Bertrand, died November 18 in Midland, Tex.

Stanley Daniloff, 61, president of Muskegon Oil Corp., died November 6 in Muskegon, Mich.

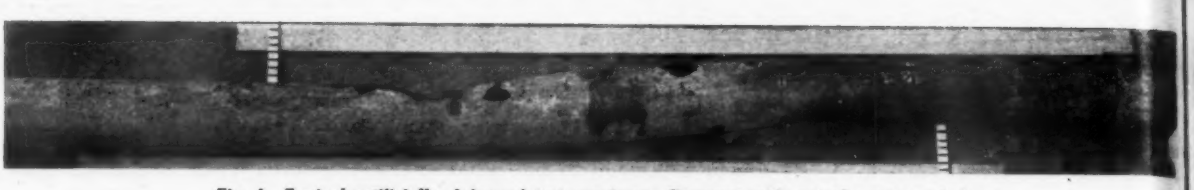


Fig. 1—Typical artificially deformed test specimen. Compare with actual specimen below.

Fig. 2—Section of 10¾-in. casing recovered from well U.P. 376, Wilmington field, California. Plastic type deformation (8 in. offset in 4 ft.) at lower earthquake damage level.

Union Pacific Studies Methods of

Designing Wells to Prevent or Minimize Damage From Earthquakes

by D. L. Roberts*

TWO unusual earthquakes have occurred in Wilmington oil field within the last 3 years. They were unusual in that they were "minor" from the standpoint of earth shock but disastrous from the standpoint of damage to oil wells.

The first earthquake, which occurred in December 1947, affected a large number of Long Beach Oil Development Co. wells but only a small number of Union Pacific Railroad Co. wells, only two of the latter being rendered nonproductive.

The second earthquake took place in November 1949 and resulted in damage to a large number of Union Pacific wells. Approximately one-half of these wells were so severely damaged as to prevent them from being produced. Geographically, severe damage to Union Pacific wells was concentrated in an area approximately 5,000 ft. long and 2,000 ft. wide which is situated on Terminal Island.

Damage to wells resulted from the fact that horizontal earth movement takes place along definite slippage planes during the quakes. Survey techniques evolved to measure the severe deformations in well casings caused by this movement revealed that damage had occurred at approximately 1,500 and 1,700 ft. Most of the major damage from the second earthquake occurred at the lower level. Correlation of electric-log markers showed that slippage planes existed in shale beds at these depths, and subsequent coring confirmed this conclusion.

While an extreme variance of depths at which damage occurs of approximately 32 ft. above and below the slippage plane exists, the majority of wells damaged have casing deformation within 10 ft. of the slippage plane. An average horizontal displacement at the lower level of about 0.8 ft. has been measured. The amount of casing affected by the slippage has been found to be as little as 7 ft. and as much as 28 ft.

Following the first of these earthquakes, Union Pacific adopted a policy of installing earthquake-damage preventive measures in all new wells in the area of known damage. These measures consisted of the scraping of pockets, which varied in diameter from 20 to 30 in., opposite the known slippage planes. Theoretical investigations of the probable stress involved in earth movements over large areas revealed that any attempts to strengthen well casings so as to be capable of withstanding such movement would be ineffective. A policy of providing larger than normal hole around the casing was therefore instituted, the basic theory being predicated on preventing transmission of formation movement to the casing, or spreading the deformation resulting from such movement over a sufficient length of casing so as to prevent severe damage.

Design of New Wells to Prevent Damage

Following the second earthquake, a correlated program of designing wells

*Chief petroleum engineer, E. B. Hall & Co., Operators, Wilmington, Calif.

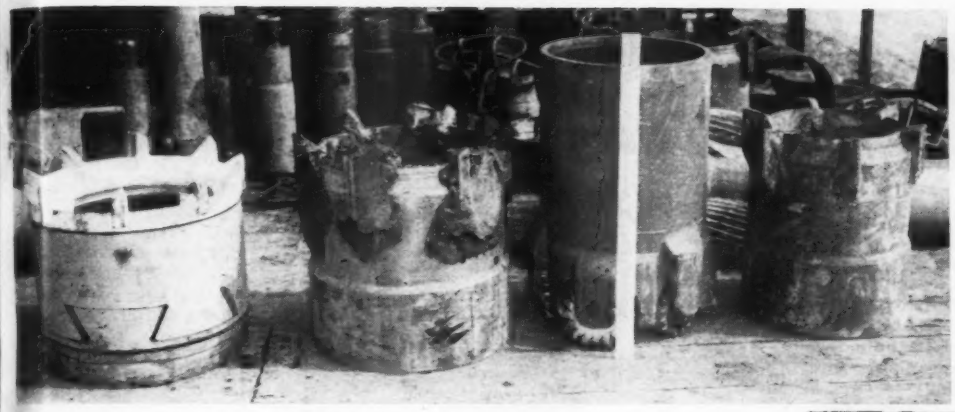


Fig. 3—Left to right: Drag-type washover shoe for flexible washover joint; drag-type washover shoe for use on 21-in. washover pipe; roller cutter shoe; drag-type shoe for use on 16-in. washover casing.

to prevent or minimize future damage, and at the same time provide facilities for economic repair of damaged wells, was evolved. This consisted of the setting of approximately 200 ft. of 30-in. o.d., ⅜-in. wall slip-joint casing, the drilling of 26-in. hole to several hundred feet below the lowest known slippage plane, and the packing of the resultant annulus between the formation wall and the 8⅝-in. or 7-in. casing with a material suitable for the preservation of the annulus.

The exact practice used in making these installations varies slightly from well to well, but essentially is as follows:

Surface hole.—Approximately 5 ft. of 38-in. casing is installed when the rig foundation is built. A specially designed riser (approximately 8 ft. long) is then flanged to the cellar floor. An 18⅝-in. hole is drilled to approximately 210 ft.; and is then opened to 36-in. diameter. Both blade-type scrapers and roller-cutter hole openers are used for this purpose. This hole is ordinarily drilled and opened in about 30 hours. Thirty-inch casing is then cemented solidly at approximately 200 ft. Conventional methods of cementing, using a back-check valve shoe, were employed in the first few wells. The time delay inherent in drilling out a large cast-iron insert containing the back-check valve has been eliminated by redesign of the shoe which resulted in elimination of the insert.

Cementing.—At present, the cementing is done by running 3½-in. Hydril internal flush drill pipe to 5 ft. above the shoe. A specially designed stripper head is then installed between the drill pipe and 30-in. casing. The cement is pumped through the drill pipe until cement returns are observed. Water is pumped down the drill pipe to clear it of cement; the drill pipe is then pulled through the stripper as high as possible in the derrick or mast and the cement is allowed to set 3 hours, after which the drill pipe is pulled out of the hole.

The alluvial formations in which the surface casing is set are poorly consolidated. Difficulty in cementing surface pipe has been encountered in the past, and at present an admixture of "exploded" perlite in the proportion of 1½ cu. ft. of perlite to one sack of cement is being used. Use of this mixture results in greater slurry yield per sack of cement (resulting in lower costs), and low slurry weight which has reduced cement losses.

Blowout.—Blowout prevention prior to the setting of the oil string casing is provided by a specially made split ring which flanges to the top of the 30-in. casing. This ring in turn supports a specially designed double Hosmer-type head with a 26⅞-in. opening. After the 7 and 8⅝-in. casing is cemented, conventional blow-out-prevention equipment is installed.

Center-punch bit.—After drilling out the 30-in. casing shoe, an 18⅝ by 12¼-in. "center punch" bit is run to the bottom of the existing 18⅝-in. hole. Approximately 2 ft. of 12¼-in. hole is drilled in order to centralize the 12¼-in. bit which is subsequently run. The 12¼-in. hole is then drilled to a depth approximately 300 ft. below the lower slippage plane. The diameter of the hole drilled below this point is dependent upon the size of casing to be set. If 7-in. casing is to be set, 9⅝-in. hole is drilled; 8⅝-in. casing is set in 12¼-in. hole.

Upon reaching the casing setting point an electric log is run.

The hole is then opened to 26-in. diameter to approximately 2,000 ft. Normally, this is done in two stages; the 12¼-in. hole is opened to 18⅝ in., which in turn is opened to 26-in. diameter. The pilot-type roller-cutter hole openers used are conventional in design, although the 26-in. tool is

(Continued on page 85)

Fig. 4—Flexible washover casing.

Fig. 5—Another view of 10¾-in. casing recovered from U.P. 403.

Economics of Petroleum Coking

For Catalytic Cracking Feed Preparation

by J. W. Jewell, Jr.* and J. P. Connor*

DELAYED coking is one of four conventional processes employed in petroleum refining to produce feed stock, from reduced crude, for catalytic cracking. Vacuum flashing, visbreaking, propane decarbonizing, and, occasionally, combinations of several make up the remainder of the field. This paper evaluates delayed coking relative to each of these parallel and competing processes.

Experience has demonstrated that the most valid and illuminating economic comparisons of competing petroleum processes result when the comparison is predicated upon a complete refinery operation and includes an analysis of the entire operation as opposed to commencing with an intermediate oil stream, as a feed stock, and attempting to evaluate unfinished products from the process in question. Accordingly, a typical refinery processing scheme, as illustrated in the accompanying schematic flow diagram, (Fig. 1) has been selected as the basis for an economic comparison.

This hypothetical refinery presently includes crude topping, straight-run fractionation, combination thermal cracking and naphtha reforming, and catalytic polymerization. The problem is to add catalytic cracking and, primarily, to select the proper type of feed preparation for the cat cracking unit. Since the interest here is principally in assaying delayed coking, Table 1 is included to define the delayed-coking process and, in general, to describe the meaning of the feed-preparation step. In principle, the coking process removes the heavy asphaltic material in reduced crude by converting it to solid coke, under controlled conditions, and in a location from which it can be removed without interrupting the continuity of the process.

Included as Table 1 are typical single-pass and recycle coking yields and utility and manpower requirements for a single-pass delayed coker charging 10,000 bbl. per stream day of Kansas reduced crude. These items plus maintenance have been evaluated against a typical Mid-Continent area price structure in order to provide an approximate picture of the operating economics of the process itself.

As a matter of interest, stream efficiencies in excess of 90 per cent have been realized in delayed cokers for periods exceeding a year. The competing feed-preparation processes differ in that they yield a liquid bottoms stream containing the asphaltic material and produce more or less gas-oil feed stock depending upon the extent of associated cracking and/or fractionation.

There remains to present and analyze the results of placing, successively, each of the four feed-preparation steps in the otherwise fixed processing sequence previously outlined. The conditions under which this comparison has been made are presented in Table 2. In each case the crude oil has been completely processed (excepting product treating), in accordance with the following assumptions with respect to processing equipment:

1. Crude topping—same in all cases.
2. Feed preparation—same barrels per stream day of reduced crude in all cases.

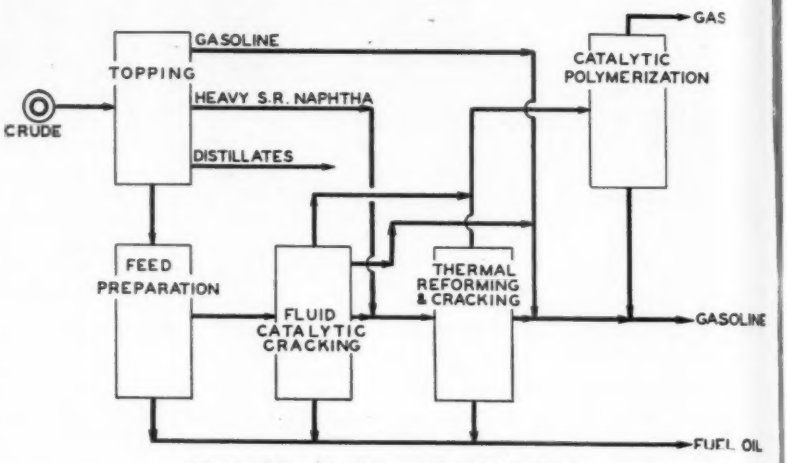


Fig. 1—Schematic diagram of typical refinery.

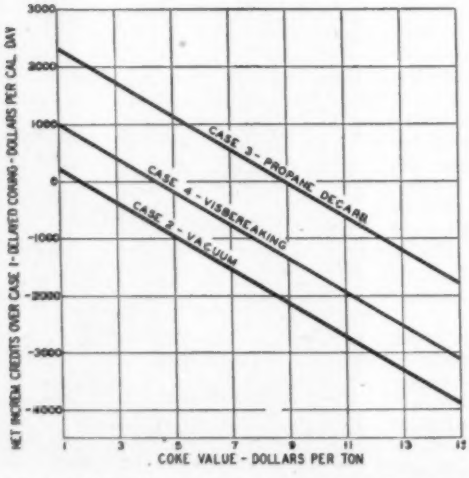


Fig. 2—Coke value vs. net increment credits over Case 1 at constant fuel oil value of $1.70 per barrel.

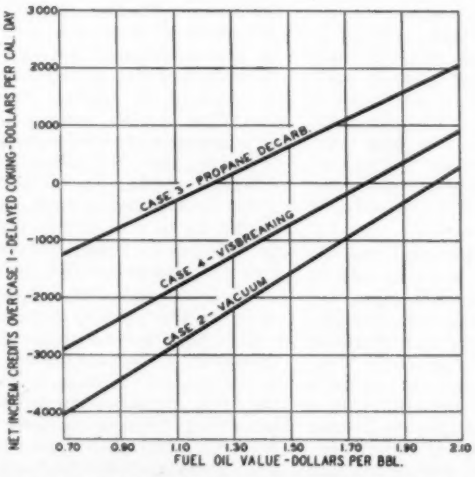


Fig. 3—Fuel-oil value vs. net increment credits over Case 1 at constant coke value of $5 per ton.

*The M. W. Kellogg Co. Presented at A.I.Ch.E. meeting, Tulsa, October 1950.

3. Fluid cat cracking—same total throughput and coke burning capacity in all cases—conversion varies with available fresh feed.

4. Thermal cracking of cat cycle oil—varies with the conversion on the cat cracker and the fuel-oil cutting-stock requirement. Capacity assumed available for the required range of feed stock.

5. Thermal reforming—same operation in all cases. Octane variation is taken care of by varying TEL content of gasoline.

6. Cat poly—capacity assumed available in each case for the polymer yield from constant per cent recovery of propanes and butanes.

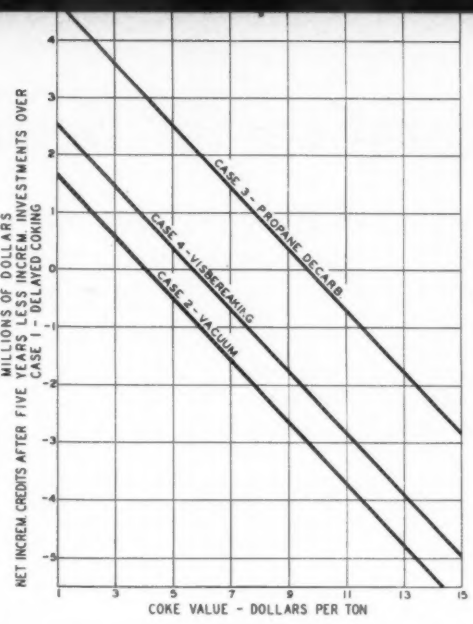

MILLIONS OF DOLLARS
NET INCREM. CREDITS AFTER FIVE YEARS LESS INCREM. INVESTMENTS OVER CASE 1 - DELAYED COKING
CASE 3 - PROPANE DECARB.
CASE 4 - VISBREAKING
CASE 2 - VACUUM
COKE VALUE - DOLLARS PER TON

Fig. 4—Coke value vs. net increment credit after 5 years less increment investment over Case 1, fuel oil constant at $1.70 per barrel.

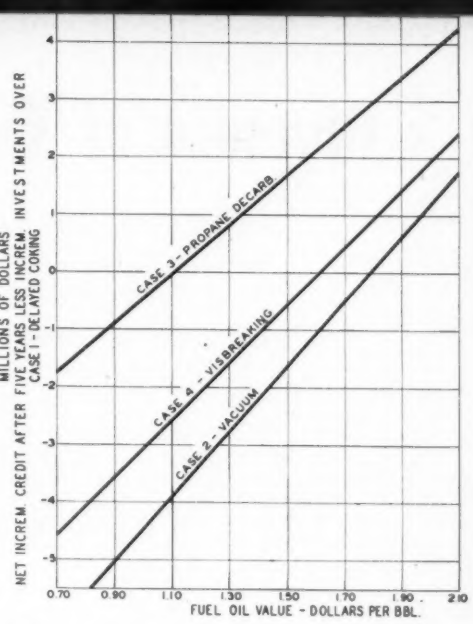

MILLIONS OF DOLLARS
NET INCREM. CREDIT AFTER FIVE YEARS LESS INCREM. INVESTMENTS OVER CASE 1 - DELAYED COKING
CASE 3 - PROPANE DECARB.
CASE 4 - VISBREAKING
CASE 2 - VACUUM
FUEL OIL VALUE - DOLLARS PER BBL.

Fig. 5—Fuel-oil value vs. net increment credit after 5 years less increment investment over Case 1, coke value constant at dollars per ton.

The over-all economics have been prepared on an incremental basis away from delayed coking as a base. Table 2 presents an over-all economic summary of the four cases and indicates the relative economic advantages of the various feed preparation steps, both in terms of incremental net earnings and incremental net credit less the incremental investments after 5 years away from delayed coking as a base.

Figs. 2 and 3 relating incremental net earnings to varying fuel oil values when the price of coke is constant and varying coke value when the price of fuel oil is constant, illustrate the importance of the product price structure. The ranges of fuel-oil and coke prices are representative of the Mid-Continent area markets over the past 5 years. Figs. 4 and 5 relate the varying price structure to the incremental net earnings of each process over a 5-year period less the incremental investment requirement.

TABLE 1—ECONOMICS OF CAT CRACKING FEED PREPARATION

Typical delayed coking yields—	Yields
Fresh feed	24.0 vol. % Kansas R.C.
°A.P.I.	18.6
Con. carb., wt. %	10.6
Vis. S.U.S. at 210° F.	140.0
T.P.R.	1.0 / 1.5
Coke, wt. %	18.6 / 24.7
Dry gas, wt. %	7.6 / 8.5
100% C_4 gaso., vol. %	22.8 / 31.0
Gas oil, vol. %	60.3 / 46.2

Utilities and direct operating costs*—	Utilities	Cts./bbl.
Labor and suprn., men per shift	†5⅔	3.5
Fuel, M.M. B.t.u. per hour	69.2	2.5
Steam, lb. per hour (avg.)	18,600	1.3
Cooling water, g.p.m.	3,480	0.4
Power, kw.	250	0.6
Maintenance		2.4
Total direct operating cost		10.7

*Mid-Continent area—10,000 bbl. per stream day S.P. delayed coker. 24.0 volume per cent Kansas reduced crude. †Three men per shift plus four men 16 hours per day on decoking.

The foregoing summaries and figures indicate, in general, that the delayed-coking process enjoys superior earning power in a soft fuel-oil market or a good coke market. The distinctly greater investment requirement for coking throws the indicated advantage to the less-expensive processes under market conditions as represented by the basic price structure.

The validity of this type comparison depends to a large extent upon the basic assumptions surrounding the calculations. In making such an analysis for a particular refinery, it would be impossible to overlook the effect of each process upon the refinery steam and water balances, the intermediate and product tankage capacities, and the ability of the refiner to market the ranges of production encompassed in the four cases. In

(Continued on page 75)

TABLE 2—ECONOMICS OF CAT CRACKING FEED PREPARATION
Over-all Economic Summary

Case No.		1			2			3			4		
Feed-preparation process		Delayed coking			Vacuum			Propane decarb.			Vis-breaking		
Crude, bbl. per stream day		36,400			36,400			36,400			36,400		
Cc. TEL to 91 C.F.R.-R. (premium)		2.0			2.0			2.0			2.0		
Cc. TEL to 85 C.F.R.-R. (regular)		1.7			1.2			1.1			1.6		
Products—	Unit cost $/bbl.	BPCD	Vol. % on crude	$/CD	BPCD	Vol. % on crude	$/CD	BPCD	Vol. % on crude	$/CD	BPCD	Vol. % on crude	$/CD
Premium gasoline	4.83	4,921	15.0	23,768	4,586	14.0	22,150	4,816	14.7	23,261	4,698	14.3	22,691
Regular gasoline	4.62	14,765	45.1	68,214	13,792	42.1	63,719	14,447	44.1	66,745	14,093	43.0	65,110
Kerosine	3.78	653	2.0	2,468	653	2.0	2,468	653	2.0	2,468	653	2.0	2,468
Range oil	3.68	3,600	11.0	13,248	3,600	11.0	13,248	3,600	11.0	13,248	3,600	11.0	13,248
No. 2 furnace oil	3.47	2,616	8.0	9,078	2,616	8.0	9,078	2,616	8.0	9,078	2,616	8.0	9,078
Fuel oil	1.70	1,965	6.0	3,341	5,078	15.5	8,633	4,324	13.2	7,350	4,721	14.4	8,026
Fuel gas (F.O.E.)	1.90	2,943	9.0	2,649	2,293	7.0	2,064	2,359	7.2	2,123	2,332	7.1	2,099
Coke per ton	5.00	*294.8	†6.2	1,474	....	....	....	....	....	....	....	....	....
Total credits				124,240			121,360			124,273			122,720
Increm. credits above Case 1				.....			—2,880			33			—1,520
Increm. debits over Case 1				.....			—1,930			—1,104			—1,345
Net increm. credits over Case 1				.....			—950			1,137			—175
Increm. invest. over Case 1 ($)				.....			—1,250,000			—500,000			—750,000
Increm. cred. after 5 yr. less increm. invest. ($)				.....			—483,000			2,570,000			430,000

*Tons per calendar day. †Weight per cent.

Plymouth's Operations at Benedum

Centralization of equipment gives Plymouth's separation and distillate-storage facilities an appearance unique in West Texas. Gas production from 29 completions runs nearly 28 million cubic feet. Distillate production is about 4,000 bbl.

by Roy F. Carlson
West Texas District Editor

PRODUCTION in Benedum field of Upton and Reagan counties, West Texas, comes from three zones: the Ellenburger, the Fusselman, and the Pennsylvanian. The first of these is deepest, being found in Benedum at about 11,000-11,500 ft. depending upon position on the structure. The Fusselman is found at depths varying between 10,500 and 11,000 ft. and the Pennsylvanian is found at about 10,-100 ft.

The casing program calls for 350 to 400 ft. of 16 or 13⅜-in. surface pipe, a 3,700-ft. length of 10¾ or 9⅝-in. intermediate pipe, and 10,100 to 9,300 ft. of 7 or 7⅝-in. oil string. A 5 or 5½-in. liner is set through the Fusselman to the Ellenburger where necessary. The intermediate string is set on top of the San Andres to enable control of circulation loss and blow-outs above and below that point. High pressures are found, particularly in the producing zones.

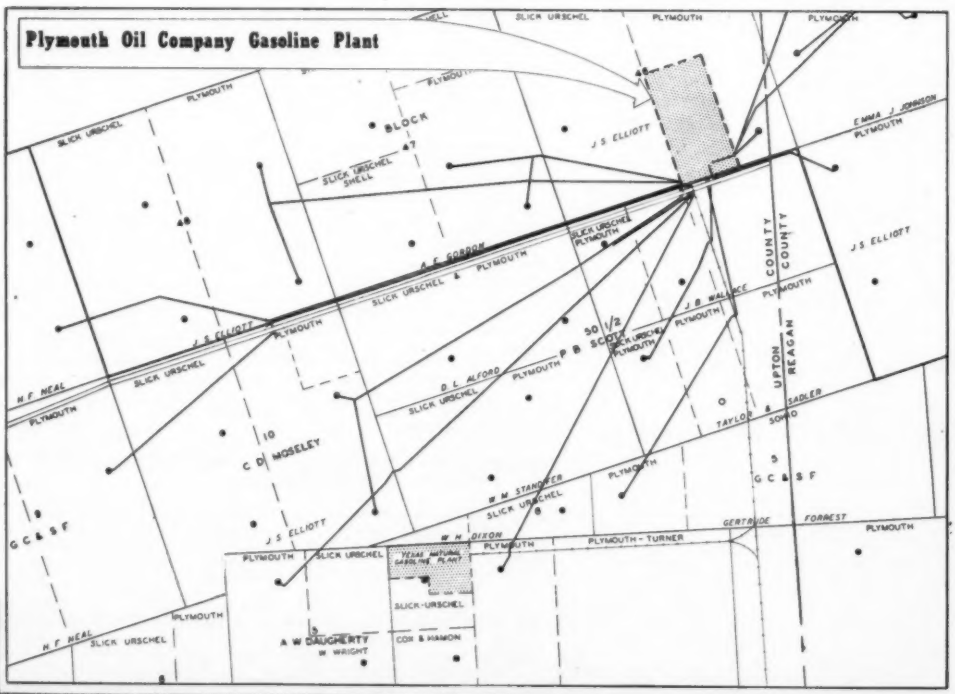
Also in the section drilled there is a black shale section that apparently begins to heave and slough if left exposed to water-base mud too long. This is corrected by appropriate control of water loss and viscosity of the mud.

Wells are completed with 2-in. tubing and usually are dually completed in the Ellenburger and Fusselman with a production packer and a side-door choke. The Ellenburger produces through the tubing, the Fusselman through the annulus.

Christmas trees are 10,000 psi. test with a 6,000-psi. working pressure. They are equipped with two gate valves on both tubing and casing flow. Shut-in. pressures average about 1,850 psi. for the Fusselman, 2,450 psi. for the Ellenburger, and 3,000 psi. for the Pennsylvanian.

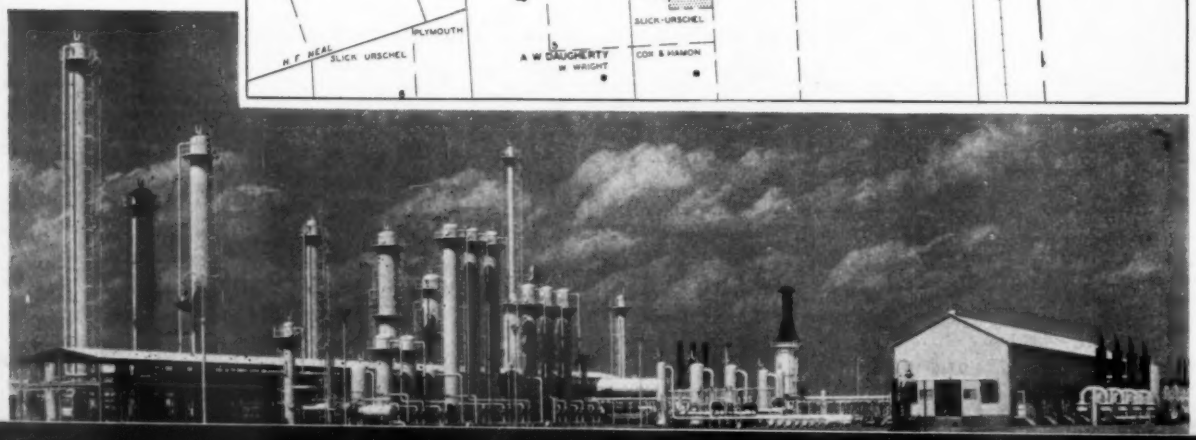
Producing Practices, Details

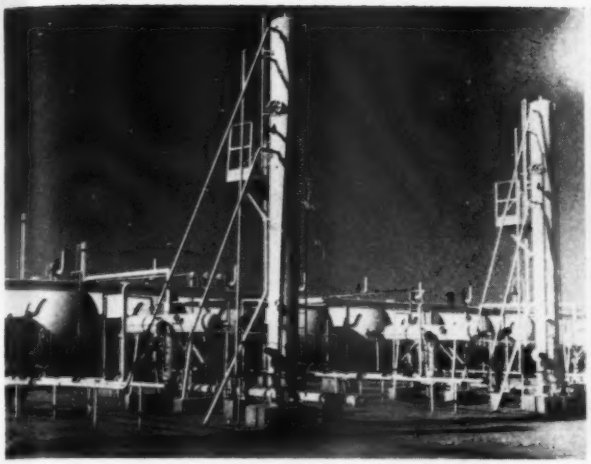
Production from each of the two zones goes through a separate cali-



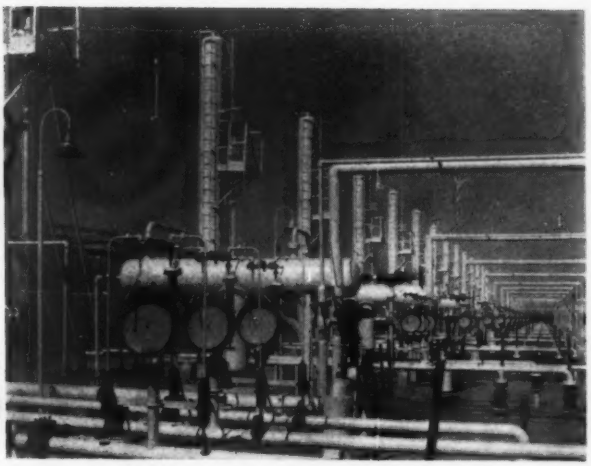
Right: Map of Benedum field, Upton County, Texas, gathering system of Plymouth Oil Co.

Below: This modern natural-gas processing plant operates to extract 75 per cent of the propane and substantially all of the butanes and heavier fractions from the inlet gas stream.





Three-stage separation is used in Plymouth's operations. Vessel in foreground contains intermediate and low-stage separators.



These meters, installed in the lines leading into the gas-processing plant, measure gas volumes at the three separation pressures.

brated meter run immediately after it leaves the well head. The meter runs are fitted with bellows-type differential recorders for measurement of the gas volumes. These volumes are later corrected fractionally for their liquid or distillate content, the basis upon which royalty payments are made. The meters operate at well-head flowing pressures.

On leaving the meter runs the fluid passes through an indirectly fired heater, is then choked down to a lower pressure, and then makes another pass through the heater. In the case of dual completions, production from one zone uses tubes in one-half of the heater. Although chokes are installed in the christmas trees, the choke at the heater is the controlling one. The production is at about 74° F. at the well head, and during summer operation reaches the separator battery at about 90° F.

From the heater the distillate-gas mixture from each of the zones flows to a header in separate 2-in. lines where the streams are mingled. From the header, flow is through a single line of larger diameter—3 or 4-in. lines being used.

All field lines are welded and are water tested to 5,000 psi. The lines are double coated and wrapped—coal-tar enamel, fiberglass wrap, coal-tar enamel, and a paper-felt wrap. Flow lines are equipped with scissor-type expansion joints at the well head and at the separator station.

Centralization of equipment gives Plymouth Oil Corp.'s separation and distillate-storage facilities an appearance that is unique in West Texas. All tankage and a battery of three-stage separation units are installed at the gasoline-plant site. The only equipment in place in the field are the well heads, production meters, and heaters.

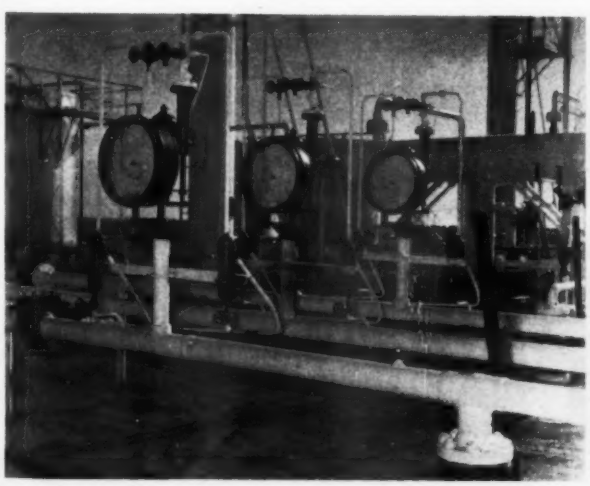
The collection of these units into a small area was made possible by two rulings of the Texas Railroad Commission. One of these was an exception to the rule that provides for storage of production distillate on the lease from which it is taken. The other is the commission's permission to use gas meters at the wells for measurement of production, making it possible to mix production from different zones soon after it leaves the well.

Storage Facilities

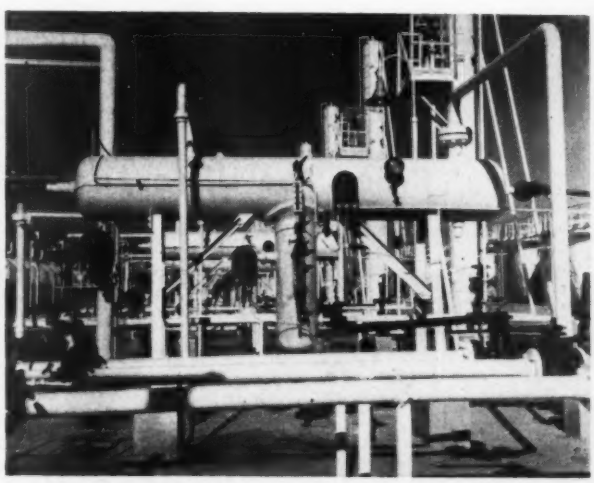
All distillate tankage is located adjacent to the plant site in one large battery of 30 tanks. The battery is constructed so that a gager can reach every tank without returning to the ground. Three or four tanks are used for each lease.

Each of the tanks is fitted with a steam coil which is used to treat high bottoms after tanks have been emptied into the pipe line. Shell Pipe Line Co. purchases the distillate from the field.

Produced gas-liquid ratios are variable in the different formations. Average values in the Fusselman production is 10,000 cu. ft. per barrel, in the Ellenburger 7,500 cu. ft. per barrel, and in the Pennsylvanian 20,000 cu. ft. per barrel. Gravities of



Simplified meter settings on inlet gas lines to the plant.

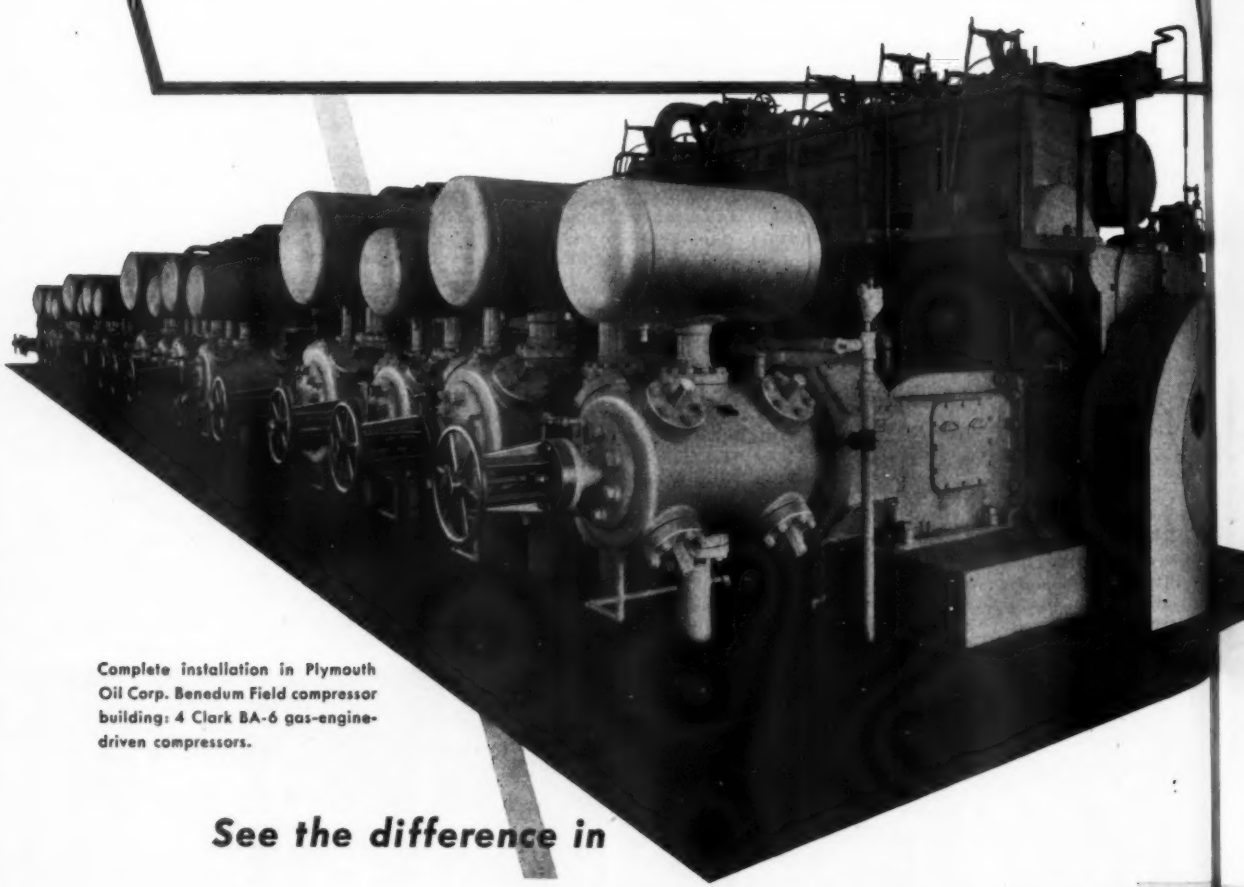


Horizontal vessel in foreground is a high-pressure separator.

XUM

CLARK

"BIG ANGLES"...

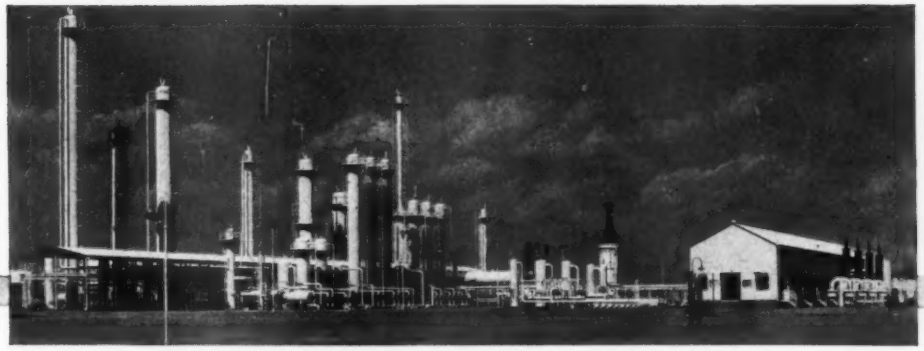


Complete installation in Plymouth Oil Corp. Benedum Field compressor building: 4 Clark BA-6 gas-engine-driven compressors.

See the difference in

CLARK

ONE OF THE DRESSER INDUSTRIES



Compact consolidation of Plymouth Oil Corp.'s processing facilities displayed in general view of plant. Compressor building in right foreground.

. . . hold down construction and operating costs in Plymouth Oil's compact Benedum plant

Consolidation, within a relatively small area, of all separation and distillate-storage facilities, was the aim and the achievement of Plymouth Oil Corp. at its gas-processing plant in Benedum field, Upton County, Texas.

And with compactness uppermost in both building size and design, it was natural that four Clark "Big Angle," 6-cylinder, gas-engine-driven compressors of 1200 BHP each, were given the exclusive assignment in the compressor plant. For, in line with Plymouth's expressed intention of holding down plant construction and plant operating costs, the job of handling 27,905,000 cu. ft. of gas per day at a discharge pressure of 850 psig. had to be accomplished by compactly built, heavy duty units, capable of conserving both space and manpower . . . characteristics for which Clark BAs are famous in many another eminently successful application.

But, while compactness could never for a moment be overlooked in Plymouth's plans, and those of Hudson Engineering Corp. who engineered and constructed the entire operation here, other aspects were of equally vital importance in giving the nod to Clark. Among them, flexibility of compressor cylinder arrangement — the ability to handle four stages of compression per unit — assured that Clark BAs would meet, with trouble-free performance, the most rigid of requirements under varying pressure conditions.

You may obtain full details on "Big Angles" and other performance-proved Clark compressors by requesting literature from the nearest Clark office.

COMPRESSORS

CLARK BROS. CO., INC. • OLEAN, N. Y.

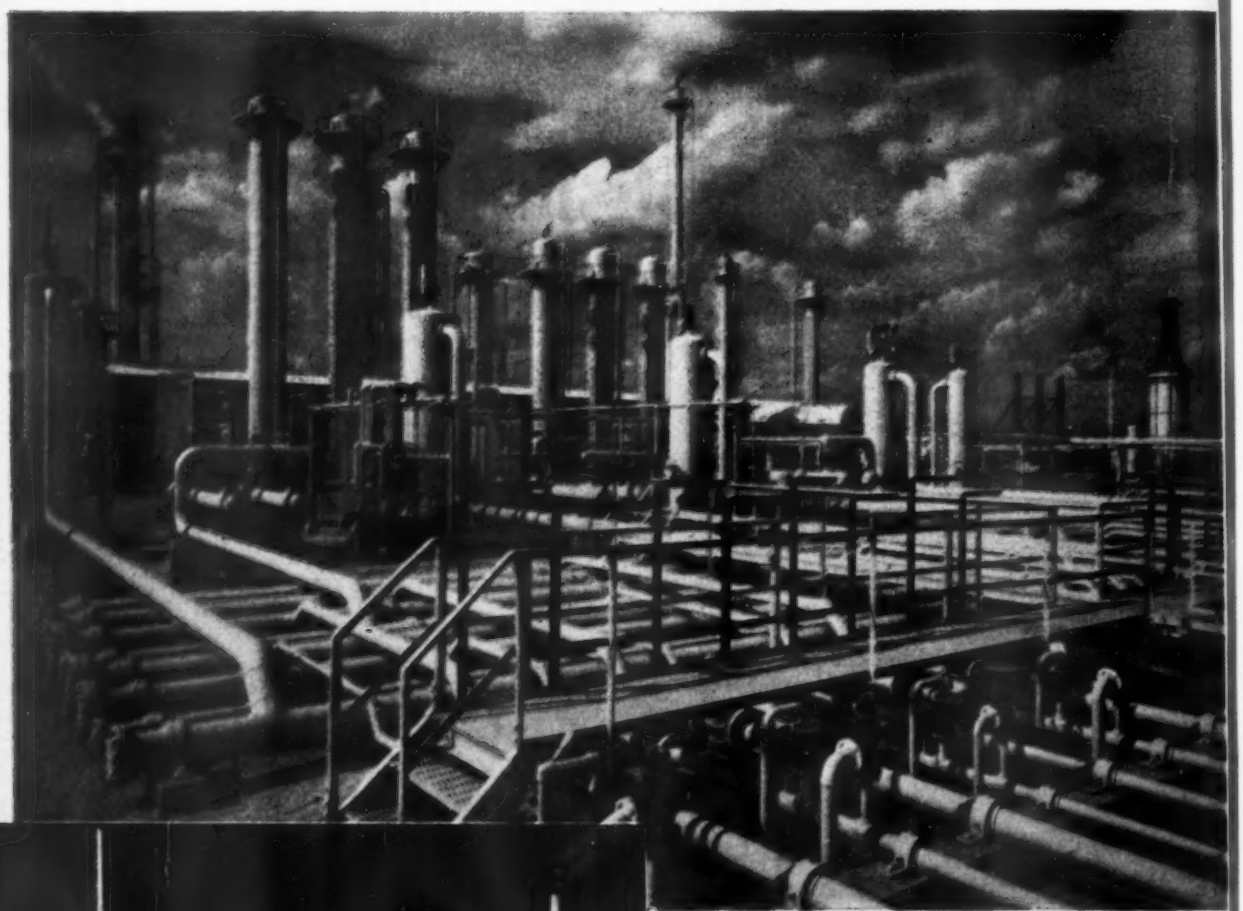
New York • Tulsa • Houston • Chicago • Boston • Washington • Los Angeles • Detroit • Birmingham • Salt Lake City • San Francisco • London • Buenos Aires • Paris • Caracas, Venezuela • Lima, Peru • Bogota, Colombia • New Delhi, India

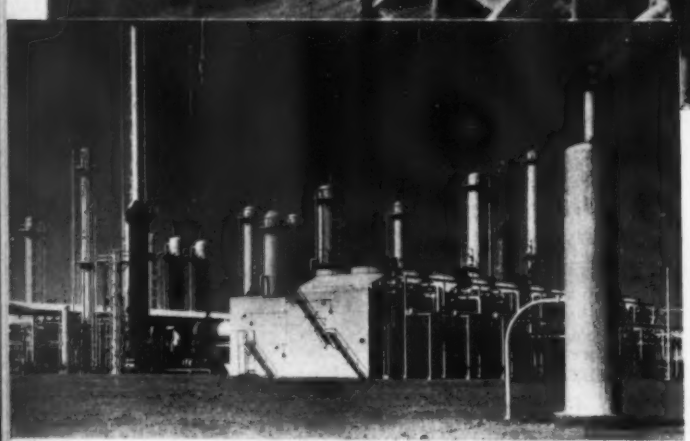
13 in '49

The Benedum Plant

in the Benedum Field, Upton County, West Texas

Designed and constructed for PLYMOUTH OIL COMPANY, the plant pictured below is one of 13 plants completed by HUDSON in 1949. Of these 13 major projects, 8 were for clients for whom HUDSON had previously engineered and constructed plants—good evidence of the satisfaction of Owners and Operators of HUDSON built plants.





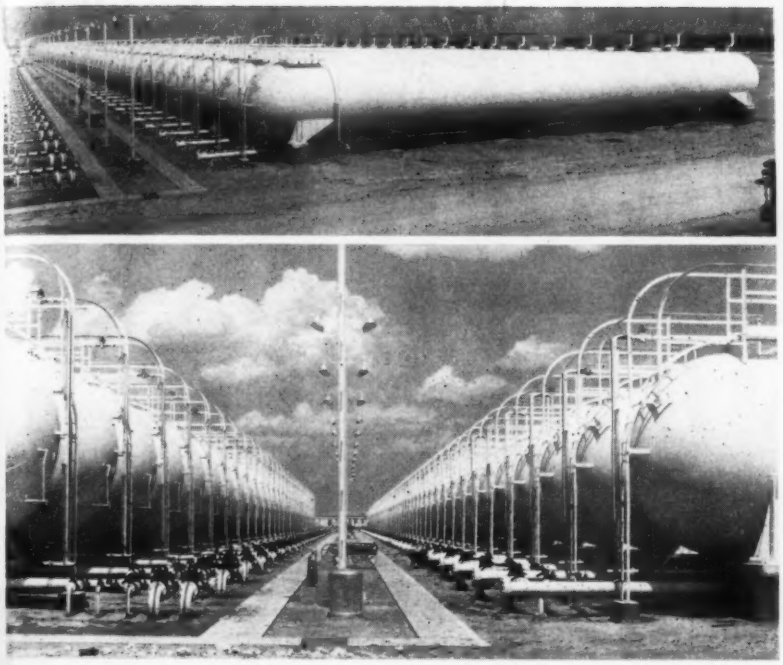
HUDSON air-cooled sections are used extensively in the Benedum Plant to minimize water consumption in this arid, water-scarce area.

HUDSON

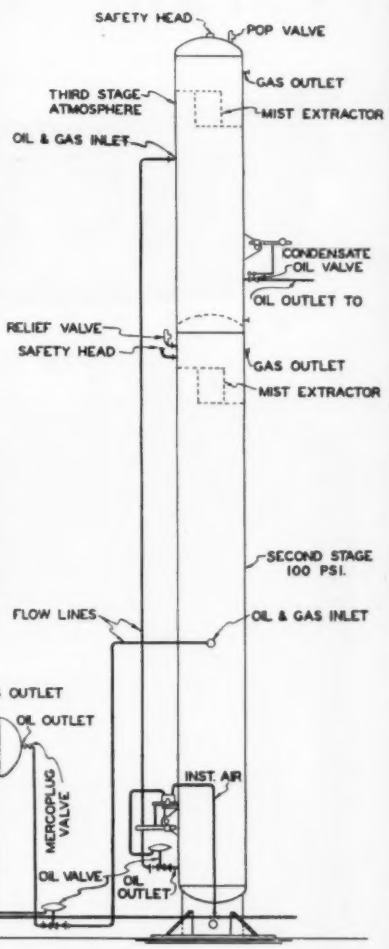
ENGINEERING CORPORATION

FAIRVIEW STATION • HOUSTON, TEXAS

GAS COMPRESSOR STATIONS — CYCLING PLANTS — GAS DEHYDRATION PLANTS — NATURAL GASOLINE PLANTS — FRACTIONATION UNITS — CRUDE TOPPING UNITS — PRESSURE MAINTENANCE PLANTS — HYDROGEN SULPHIDE REMOVAL PLANTS — ATMOSPHERIC AND VACUUM DISTILLATION UNITS



Above: Storage facilities at Plymouth's Benedum plant consist of 56 horizontal propane tanks, 30 horizontal butane tanks, and three 12,000-bbl. casing - head - gasoline storage tanks. Heavier products and absorption oil are stored in 1,000-bbl. cone-roof tanks.



Schematic arrangement of the three-stage separation system.

the distillates produced are: Pennsylvanian, 55° A.P.I.; Ellenburger, 57° A.P.I.; and Fusselman, 59° A.P.I. All distillate is very light in color, and that from the Pennsylvanian is water white.

Plymouth's gas production from 29 completions runs about 27,905,000 cu. ft., measurement being on a 14.65-psi. pressure basis. Distillate production is about 4,000 bbl.

The 29 completions represent 19 wells, since the 10 Fusselman completions are dualed with Ellenburger completions. There are five Pennsylvanian completions, all single, and four single Ellenburger completions.

Separation System

Before the produced gas and distillate enter the separator process, they go through a regulator that is controlled pneumatically from the gasoline plant. The regulators on each of the field lines will automatically shut in producing wells if a failure occurs in the plant.

The gas and distillate, during the colder months of the year, pass through a small heater that is supplied with plant steam.

Distillate and gas separation is accomplished in three stages. The high-pressure separators are horizontal and include a water knockout feature. The intermediate and low-stage separation takes place in one unit, one separator being mounted above the other. These tall vessels give the separation station a gasoline-plant-like appearance and since they are installed so near to the plant itself appear to be a part of it. Pressures for the three stages are 570 psi., 60 psi., and about atmospheric pressure. The low-pressure separators can operate at pressures from 0 to 30 psig.

Gas from the various stages enters various parts of the gasoline plant. The high-pressure gas bypasses the compressors of the gasoline plant. Another line is installed at the separation station, and is designed to carry gas and liquid at about 300 psi. This fourth line was installed to handle some of the weaker wells as their pressure dropped. In this event, the separation procedure would be the same, except that the high-pressure separators would operate at the lower pressure. The gas is again metered as it leaves the various stages of separation with recording meters.

Gasoline Plant Features Combination Cooling Tower and Air-Cooled Condenser Installation

PLYMOUTH OIL CO.'S gas-processing plant in Benedum field in Upton County, Texas, engineered and constructed by Hudson Engineering Corp., was placed in operation in December 1949. The plant compresses gas from various separator batteries to a discharge pressure of 850 psig. At this pressure the gas is treated for the removal of hydrogen sulfide, for the extraction of propane and heavier hydrocarbons, and for the removal of water vapor.

The denuded gas, commercially free of hydrogen sulfide and with a water-vapor content of less than 7 lb. per M.M.c.f. then flows into a pipe line. The plant recovers better than 75 per cent of the propane in the inlet gas streams, and substantially

PROPANE STORAGE FOR PLYMOUTH

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EACH OF THE 56 VESSELS SHOWN ABOVE ARE 10′ 6″ IN DIAMETER, 108 FEET LONG AND WEIGH APPROXIMATELY 75 TONS. THEY WERE FABRICATED BY McNAMAR FOR THE HUDSON ENGINEERING CORPORATION FOR INSTALLATION AT THE PLYMOUTH OIL COMPANY PLANT AT RANKIN, TEX. THE SIZE AND QUALITY OF THIS JOB IS TYPICAL OF McNAMAR'S ABILITY IN THE FABRICATION FIELD . . . YEARS OF EXPERIENCE PLUS PRECISION WORKMANSHIP MAKE McNAMAR YOUR BEST BET FOR ANY FABRICATION PROBLEM.

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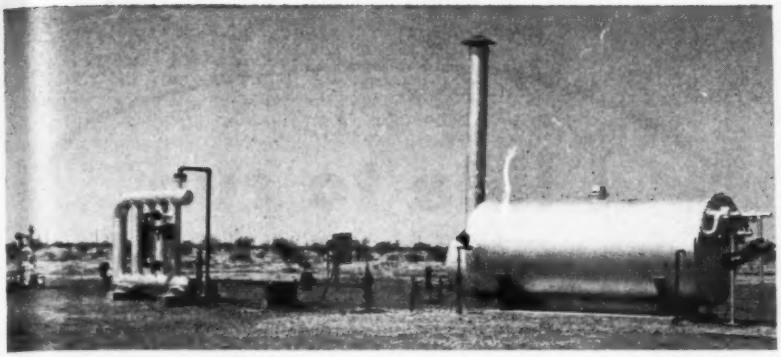
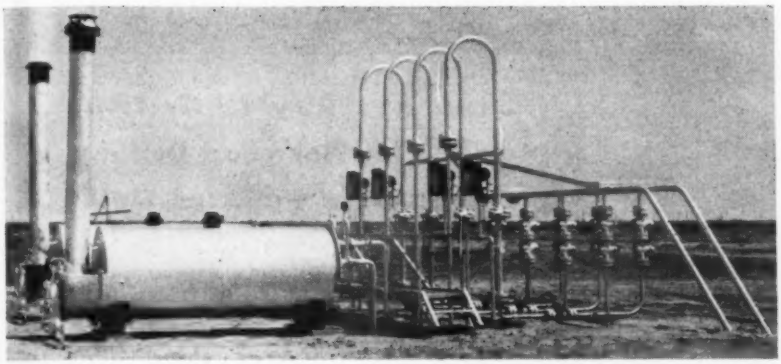


Heater, well head, and an experimental installation of a water knockout on Plymouth's A. E. Gordon lease.



This heater and orifice-meter setting is located on a Slick-Urschell lease in Benedum field.

all of the butanes and heavier hydrocarbons.

The compressor plant.—This section consists of four 1,200-hp. gas-engine-driven compressors, four stages of compression are employed. A portion of the gas from separator batteries enters the plant at the suction of the first, third, and fourth stages of compression. Condensate produced by cooling the compressed gas is pumped through a contactor where hydrogen sulfide is removed by reaction with monoethanolamine.

Hydrogen sulfide removal.—Gas from the compressor plant flows in parallel through three contactors where it is countercurrently contacted by an aqueous solution of monoethanolamine for the removal of hydrogen sulfide. The spent amine is reactivated and recirculated to the contactors. Gas from the contactors then flows to the absorption plant.

The absorption plant.—Three absorbers are operated in parallel at approximately 850 psig., where, by contact with lean absorption oil, the propane and heavier hydrocarbons are removed. The rich oil then flows through a flash tank and into a "Rich Oil Propanizer,"* where methane is removed from an additional propane absorbed in the rich oil. The resulting rich-oil stream is then pumped into the high-pressure still.

To reduce the consumption of steam in the plant a two-stage distillation system is employed. The rich oil is partly denuded in the high-pressure still and from this still flows through a rich-oil heater into the low-pressure still where the stripping of absorbed hydrocarbons is completed. Uncondensed vapors from the high-pressure still are returned to the reabsorber. Raw product condensed from hydrocarbons stripped from the absorption oil is pumped into a deethanizer.

Ethane removed overhead from the ethanizer is partially condensed by refrigeration at approximately 65° F. and the condensate used as reflux for the column. A portion of the uncondensed overhead vapor is used as boiler and heater fuel and the remainder is returned to the suction of the fourth stage of compression and is recombined with high-pressure gas entering the plant.

The deethanized product leaving the bottom of the deethanizer is fractionated into commercial propane, isobutane, normal butane, and casinghead gasoline. The propane is dehydrated before flowing to storage.

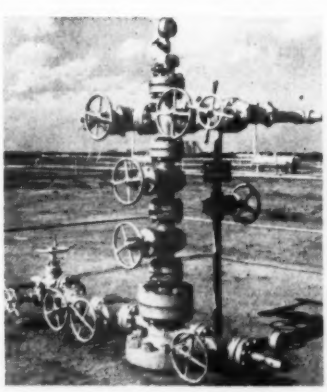
A caustic-treating unit is installed in the plant to remove methyl mercaptan from the deethanized product stream. A Perco treating unit is installed in the casing-head gasoline stream to convert any remaining mercaptans to polysulfides in order that the casing-head gasoline may meet commercial specifications.

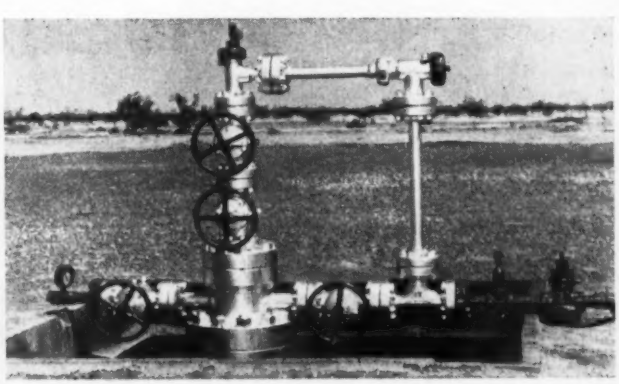
Skimming plant.—This section is installed to produce motor fuel, kerosine, absorption oil, and bottoms from a portion of the crude distillate from field separators. This skimming plant is also used to rerun a side stream of absorption oil from the absorption plant, to maintain absorption-oil specifications.

Refrigeration plant.—This installation consists of two 75-hp. Ingersoll-Rand steam-driven compressors, using propane as a refrigerant. By means of this unit, a reduction in the loss of propane from the deethanizer overhead is accomplished through the use of lower condensing temperatures.

The storage plant.—This facility includes 56 horizontal propane storage tanks each with a capacity of 1,570 bbl., for a total propane storage capacity of approximately 88,000 bbl. The butane storage battery consists

*Copyrighted—process patented.





Surface fittings on Benedum field wells: Republic Natural Gas Co.'s Barnett 1-C, and Plymouth's 1 A. E. Gordon. Plymouth's well is one of the single completion's in the field. Most of the Benedum field wells are dually completed.

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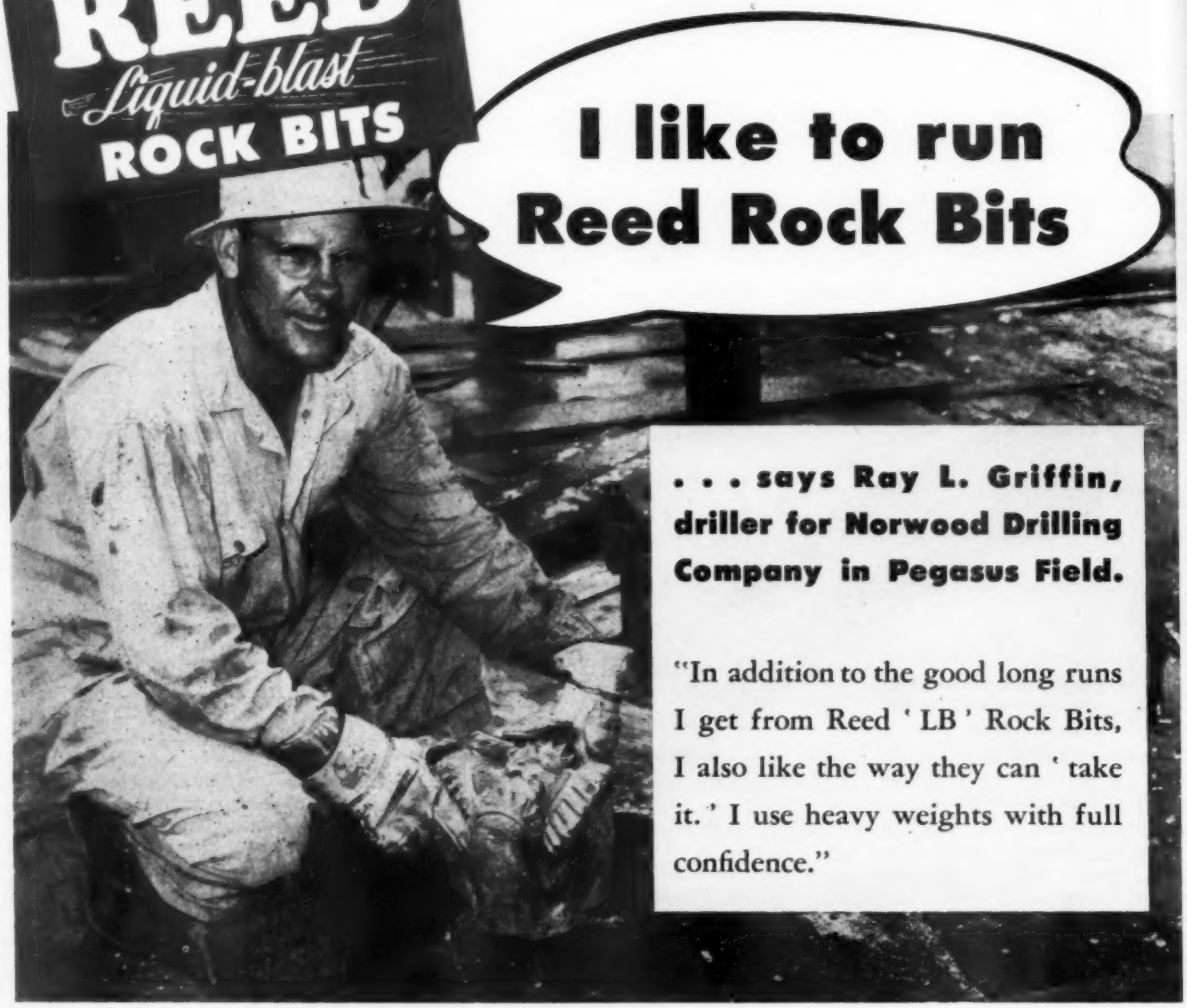
Liquid-blast
ROCK BITS



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of 30 horizontal tanks each with a capacity of 1,583 bbl. for a total butane storage capacity of approximately 47,500 bbl. There are three 12,000-bbl. casing-head-gasoline storage tanks and eight 1,000-bbl. cone-roof tanks for storage of motor fuel, kerosine, absorption oil, and bottoms.

Cooling and Condensing Equipment

A unique feature of the plant is the combination cooling tower and air-cooled condenser installation. Water in the area is very scarce and of very poor quality. It was therefore necessary in the design of the plant to limit the consumption of water to a bare minimum.

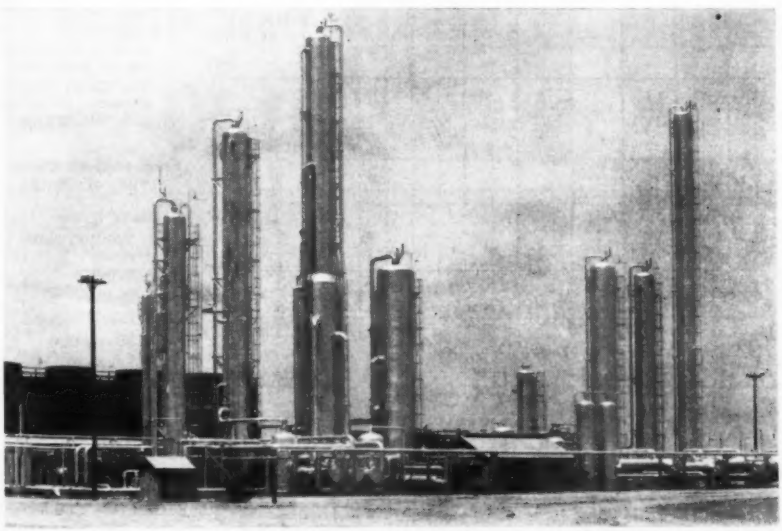
Air-cooled condensers and coolers are used for every application for which they are suitable. However, because of the unusually high ambient temperatures in the summer, the conventional use of air-cooled equipment would have been limited to a few installations. This limitation has been overcome in a novel manner by the installation of a combination unit which draws air through a cooling tower, where the limited amount of water used in the plant is cooled, and where simultaneously the air flowing through the tower is cooled. The cooled air stream then flows across tubes of the air-cooled condensers and coolers.

Temperature of the air is reduced approximately 20° F., which in the summer is from 100° to 80° F. Subsequently in flowing across the air-cooled sections the air temperature increases 40° to 50° F. leaving the air-cooled units for many more services than would have been possible had the air temperature not been reduced below its ambient value of 100° F. Likewise because the air is heated over a temperature range approximately twice that through which it is cooled, the consumption of water used in the process is less than would have been used had water been employed entirely for the condensing and cooling services.

Not all of the air-cooled units employed in the plant are installed in combination with the cooling tower. The engine jacket water coolers and the exhaust steam condensers use ambient air. The vapor condensers and final product coolers use air which has been precooled by the cooling tower. This arrangement not only precools the air but also washes the dust from the air, which at times is a very important consideration in the West Texas area in which the plant is installed.

Dehydration plant.—As above mentioned, gas from the absorbers flows through dehydrators where the water vapor content of the effluent gas is reduced to less than 7 lb. per M.M.c.f. The Hudson "Dessiflo process" of gas dehydration is employed for this purpose. Though the effluent-gas temperature may be as high as 110° F., the plant has never failed to meet gas dew-point requirements. The process, which has been described in previous articles, employs a continuous flow of liquid desiccant which is pumped over the dehydrators, the spent desiccant being regenerated in a reactivator column.

The plant is located approximately 12 miles north of the Santa Fe Railroad. A spur line originating at Texon was constructed to the plant site. This spur terminates at the plant loading rack which is double tracked and is 30 car spots in length, thus providing 60 car spots.



***ANOTHER BENEDUM PLANT.**—This view of Texas Natural Gasoline Corp.'s Benedum field natural-gasoline plant shows the main processing section. Production capacity rating on this plant is 200,000 gal. per day of total liquid. The plant is geared to produce L.P. gas. In addition to this installation, Texas Natural Gasoline Corp. operates three other natural-gas-processing plants in Texas, located in Pecos, Cooke, and Jones counties.*

Petroleum Coking

(Continued from page 65)

many cases one or more of these considerations impose limitations which dictate choice despite relative economic desirability and in any event the magnitude of the outside facilities problem is potentially great enough to completely alter the general conclusions reached in the basic analyses which we have presented.

For many years the delayed coking process has been regarded with disfavor by many refiners, due largely to its intermittent type of operation, its dirty and tedious coke-removal and handling problems, and its relatively high investment and operating costs. On the other hand, when the supply of residual fuel oil has exceeded the demand, coking has provided the only complete relief from the necessity of reducing crude runs or building expensive storage capacity. This flexibility, coupled with its high earning power in the presence of a good and stable coke market has proved profitable.

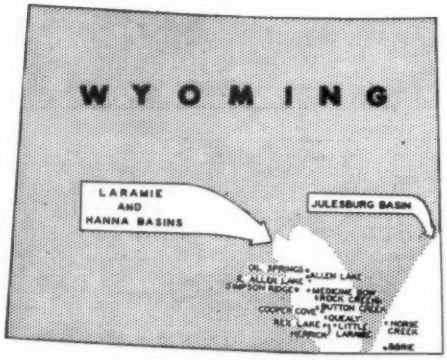
The quality of coker gas oil as a feed stock for catalytic cracking has been thought by many to be inferior to the product made by the other feed-preparation processes. It is our opinion that, as in other feed-preparation methods, the feed stock and type of operation constitute the principal quality-determining factors rather than the process itself.

A feed-preparation process which will provide the ability for the refiner to shift at will from solid to liquid residual fuel, and yet not be dependent for its economic justification upon the market conditions of either residual product, is the aim of current development work in the field of petroleum coking. Since all of the major disadvantages of conventional delayed coking are associated with the coke-removal and handling equipment, the principal efforts of development work (presently in the pilot or semicommercial plant stages) are directed toward the simultaneous production and removal of coke in a system analogous to fluid catalytic cracking. It is anticipated that success in perfecting such a system will not only remove much of the operating prejudice against coking but also materially improve its economic attractiveness.

The distinct possibility of improved operating flexibility both with respect to the range of feed stocks which may be coked, and reduction of the extent of cracking associated with coking, also provide incentive for the development of a more attractive coking process. The presence of an apparently unlimited market for petroleum coke, at some price, and the probability of fuel oil continuing to be a local or periodic problem, indicate that a coking process will continue to have a place in petroleum processing for many years.

Wyoming Correlations

Penetration Chart for Julesburg, Hanna, and Laramie Basin



EXPLANATION

Approximate geologic horizon exposed on surface of crest of structure

Oil producing zone
Depth (average or minimum and maximum)
Gravity of oil
(average thickness shown on the right)

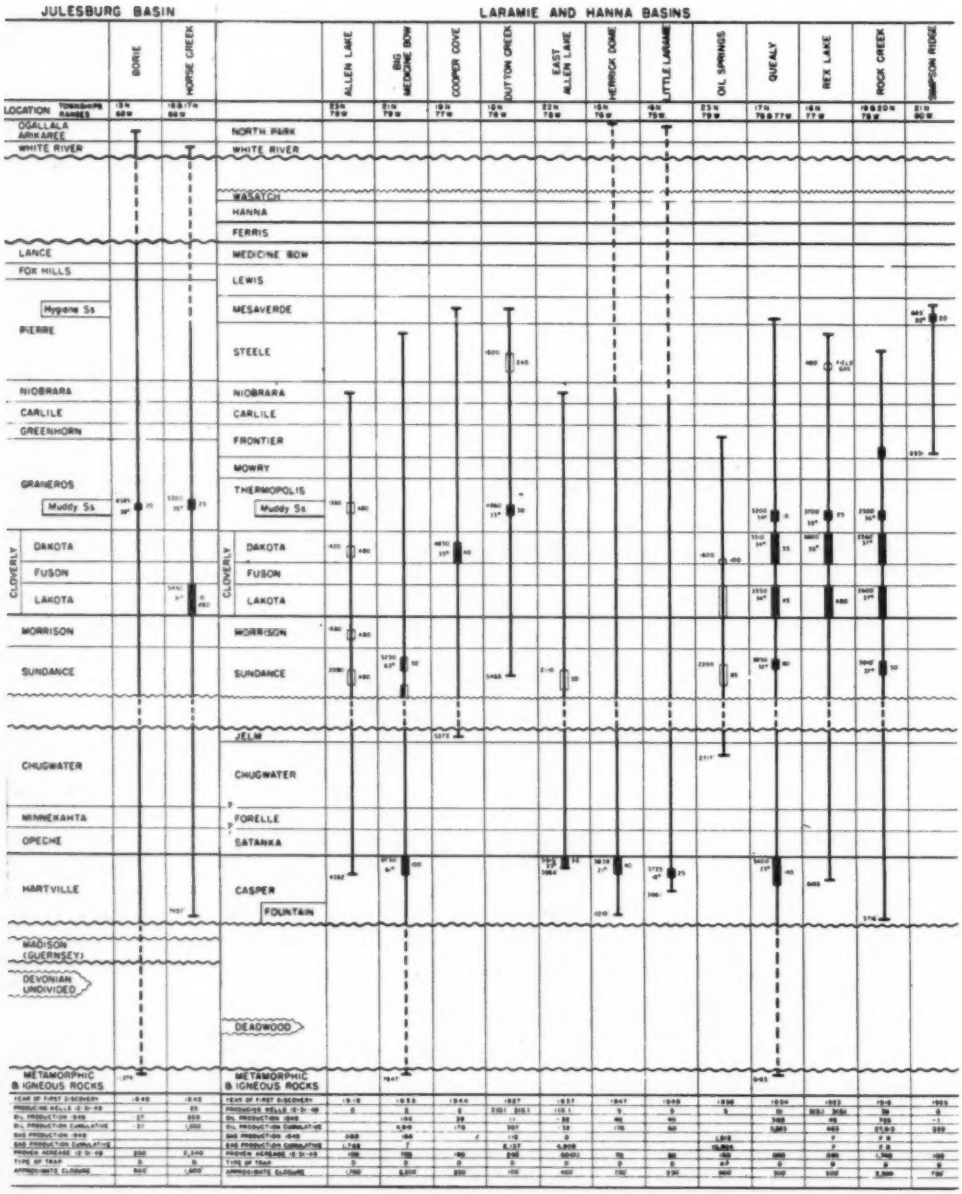
Gas producing zone

Oil and gas producing zone

Gas and condensate producing zone

Section missing

Deepest penetration



*Some wells started in Hillard overthrust on Wasatch. One to several oil or gas zones.

Fields and data are as of December 31, 1949, except for a few 1950 new zones and total depths.

Producing wells include active wells only. (O) = Oil. (G) = Gas.

Proven acreage is usually of the largest pool.

Oil production in thousands of barrels.

Gas production is in millions of cubic feet.

C = Condensate. Amount not available.

Abbreviations Under Gas Production

F = Gas is used in field
L = Gas is blown or lost
R = Gas is used in recycling, repressuring or injection
S = Gas from outside sources is stored and withdrawn

Abbreviations Under Type of Trap

A = Anticline
AF = Faulted anticline
D = Dome
DF = Faulted dome
D(2) = Double dome
M = Monocline
T = Terrace
MU = Monoclinal unconformity
FT = Fault trap
N = Nose

Compiled by a Nomenclature Committee of the Wyoming Geological Association. Complete set of charts for Wyoming may be purchased through Petroleum Information, Inc., Box 2452, Casper, at $2.00 per set.

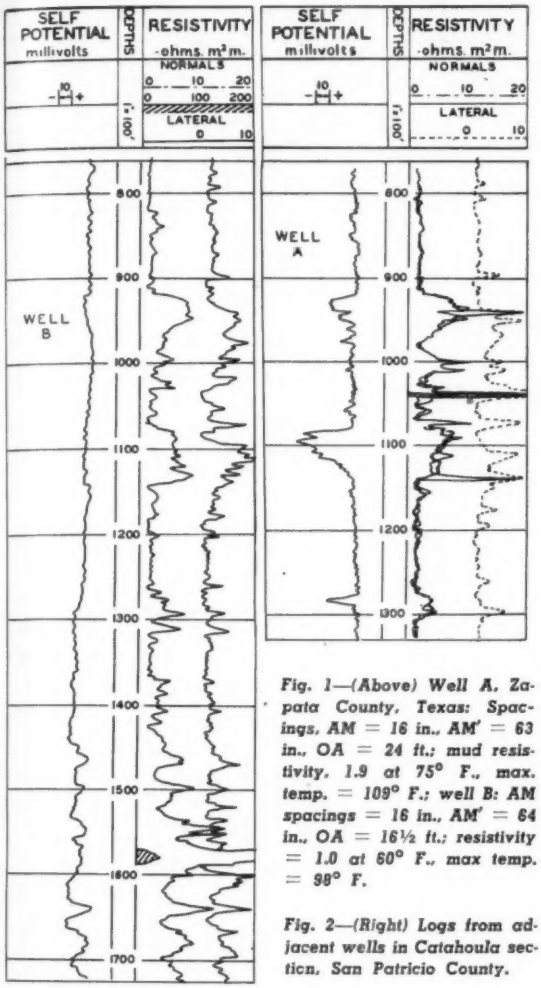


Fig. 1—(Above) Well A, Zapata County, Texas: Spacings, AM = 16 in., AM' = 63 in., OA = 24 ft.; mud resistivity, 1.9 at 75° F., max. temp. = 109° F.; well B: AM spacings = 16 in., AM' = 64 in., OA = 16½ ft.; resistivity = 1.0 at 60° F., max temp. = 98° F.

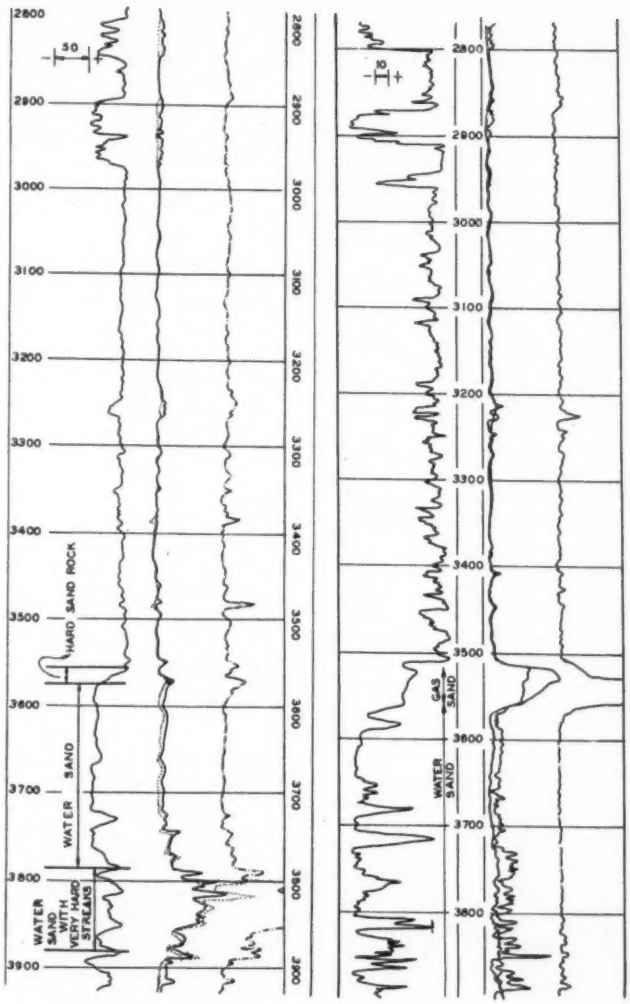


Fig. 2—(Right) Logs from adjacent wells in Catahoula section, San Patricio County.

Well-Site Interpretation Of Electric Logs

Want a practical discussion of electric logs? Here you have it, plus Southwest Texas case histories

by H. N. Lyle*

SOUTHWEST Texas isn't the only area that offers problems in the interpretation of electric logs, but there are several geological factors that complicate interpretations to an extent not common in other areas. For one thing, production may be found at any depth from the grass roots to the bottom of the hole.

Production is or has been obtained from every sand series present in the area, ranging in age from the Largarto of the upper Miocene to the Wilcox of the Eocene and in depth from 160 ft. at Charco Redondo, to 10,000 ft. at McAllen and Virginia.

The sands vary greatly in shale and colloidal content. Much of the production is obtained from stratigraphic strand-line traps, and by their very nature these sands will vary in porosity, permeability, and electrical properties. Even on anticlines, the structural movement often seems to have been coincident with deposition, so that the sands at the crest of the structure will be much less permeable than they are on the flanks or in areas of low relief.

The presence of highly resistant material, such as fresh or sulfur water or lignite, in permeable sands account for many large electric-log "kicks" that fail to produce, while many low-resistivity sands turn out to be good producers when someone works up enough courage to set pipe on them. Why?

In order to form a basis for evaluating the probabilities of production from any given zone on an electrical log, it is necessary to know what causes the curves on the log to assume the shape and values they exhibit, and, equally important, what factors may be preventing the lines from presenting more tangible evidence of oil or gas accumulation.

The Self-Potential Curve

The self-potential curve, recorded on the left-hand side of the log, records the sum of the electrical effects, in the hole, of the electrochem-

*Consulting petroleum engineer, Corpus Christi, Tex.

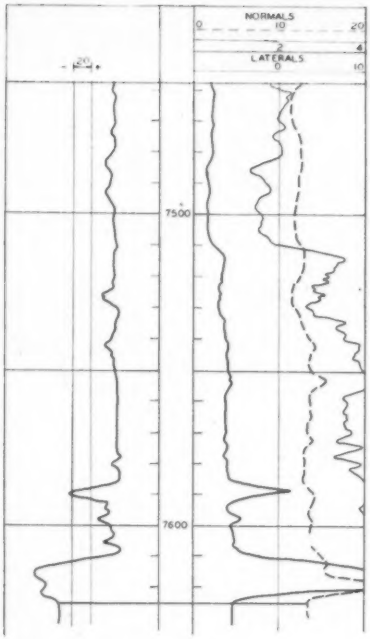


Fig. 3—Eocene Wilcox section, well in De-Witt County, Texas.

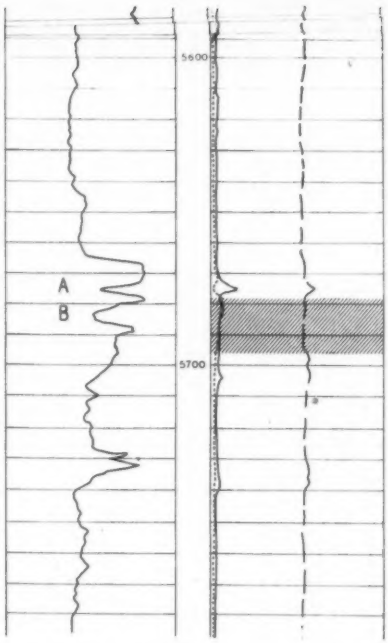


Fig. 4—Note short resistivity reversal at A, where sand is thinner than electrode spacing.

ical and electrofiltration phenomena effective at the recorded depth. For practical purposes, sufficient to the majority of electrical log users, it records the relative porosity and permeability of the formations, with certain qualifications. There are no absolute values on this curve. All the measurements are relative, which in practice means that the sands, normally, show negative direction or leftward peaks from the shale line which is more positive and is used as a reference line.

No sand necessarily shows an amplitude of deflection, or kick, commensurate with any property of that sand; it may have either a positive or negative kick, or none at all, depending upon some of the qualifying factors effective at the time. These factors are: the nature of the mud in the hole (especially its salinity), the salinity of the formation water, the shale or colloidal content present, the nature of the adjacent formations, the thickness and resistivity of the formation, the mud pressure differential on the sand, and the depth of mud filtrate invasion.

Salty mud causes the S. P. (self-potential) curve to lose a great deal of its character, and to even invert its normal appearance if the mud is highly salty. Southwest Texas wells seldom encounter salt while drilling, as do some of the wells in the piercement-dome fields in the upper coast, but frequently it is necessary to use brackish water for drilling because no other is available.

Another source of salt contamination in the mud is the high-pressure salt-water sands that are penetrated frequently, especially in the top of the Vicksburg section. When comparing logs, the mud resistivities should always be noted, and if they are markedly different, allowances should be made for the subnormal appearance of the sands in the well with the lower mud resistivity.

Fig. 1 shows two wells in Zapata County penetrating the same Jackson section. Well A was drilled with rain water collected in a surface tank, while Well B was drilled with water from a gun barrel on a nearby lease. Note the suppression of the S. P. curve on Well B at the 900 and 1,100-ft. sands, and the reversals on the S. P. below 1,400 ft. where the sands carry fresh water.

The sand series below 1,400 ft. also produces gas, and sometimes oil, throughout the whole Jackson trend where there is structural closure, so that a log such as the one shown certainly leaves plenty of latitude for decisions on side-wall coring. The large fourth curve resistivity peaks are caused by beds of lignite. Neither of these wells was productive.

One relationship in the S. P. curve that is subject to a great deal of misinterpretation is that between the resistivity and the size of the S. P. kick. Sands containing oil or gas, particularly if they are somewhat shaly, show a depressed S. P. kick opposite the oil or gas zone.

Gas sands in general are more depressed than are oil sands, possibly because of lower connate-water saturations. It often is not possible to differentiate between a highly resistive gas sand showing a depressed S. P. and a highly resistive impervious streak of, for instance, crystalline sandstone.

Fig. 2 shows portions of logs from adjacent wells in the Catahoula section in San Patricio County. One section is a very prolific gas zone, while the other one contains only sandstone streaks. Zones of high resistivity regardless of the size of the S. P. kick, should always be side-wall cored thoroughly.

Sands less than 8 or 10 ft. thick do

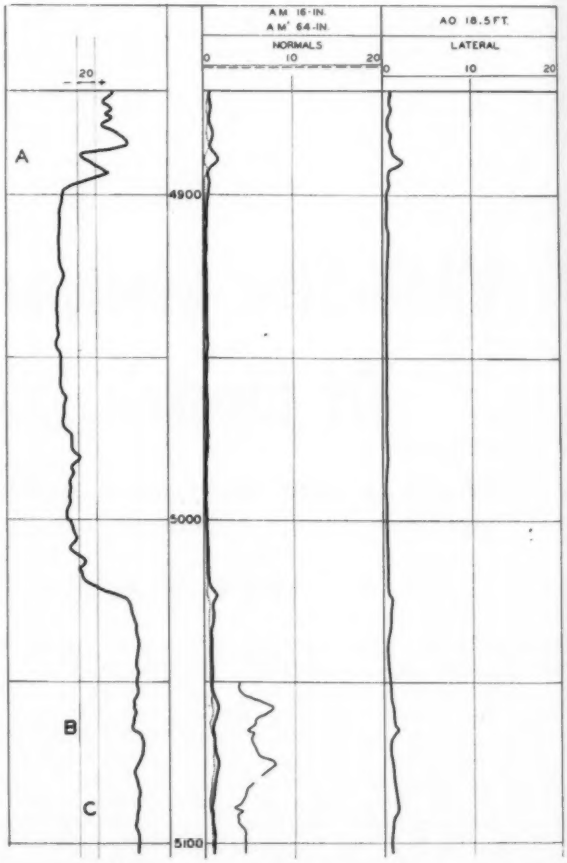


Fig. 5—Resistivity is slightly "dished" at A, but less noticeable at points B and C.

not develop as much S. P. kick as those of identical properties but greater thickness, and the kicks become progressively smaller as the sands decrease in thickness.

To summarize the influences of the factors contributing to the size of the S. P. kick, it is known that a kick which would otherwise be of normal size may be decreased by salty mud; presence of resistive material in the sand, such as gas, oil, or fresh water; presence of shale or ash (either as a mixture or in thin layers), or excessive mud-filtrate invasion.

On the other hand, a large kick does not necessarily indicate the presence of a permeable zone. This is particularly evident when an impermeable streak exists between two permeable sections, such as a sandstone streak in a permeable sand section, as in Fig. 3, showing a part of the Eocene Wilcox section from a well in DeWitt County.

Porosities from S. P. Curves

From the foregoing summary, it would appear that the S. P. log is not susceptible to quantitative interpretation, as is indeed the case if there is no information available on the section except that shown on the log. However, if certain generalizations are accepted, the S. P. curve can be used to estimate porosities with fair accuracies. These generalities are: (1) the total S. P. kick is due to electrochemical phenomena, (2) the electrofiltration component is negligible, (3) the bed is thicker than the critical thickness necessary to develop the full amplitude of the kick, and (4) the S. P. kick has not been greatly dampened by the resistivity of oil or gas present.

Accepting or correcting for the foregoing generalities, the work of several investigators has shown that the following relationship exists:

$$SP = K \log_{10} \frac{R_m}{R_w} \qquad (1)$$

where

R_m = mud resistivity

R_w = resistivity of the formation water

K = an empirical constant ranging in value from —70 to —90 for clean sands and from —50 to —70 for shaly sands.

If enough information is available on the sand to estimate K, then R_w can be computed. If a chemical analysis of the formation water is available then R_w can be calculated or read from resistivity vs. salinity charts available from the logging service companies, in which case K can be established for that particular sand. However, K is not what we are seeking; we want to estimate the porosity.

The porosity has been found to have the following relationship:

$$p = \sqrt[n]{1/F} \qquad (2)$$

...consumption aver-
...comparison, oil consumption ...
...4,200,000 barrels daily in 1941. To-
...greater ... total consumed du...
1945, the peak year of World War II.

Pipe In Short Supply?

Otis Tubing Caliper Determines Extent of Internal Corrosion

Wire Line Operations Permit Surveys Under Pressure, Without Killing Well or Pulling String For Surface Inspection

Faced with a possible shortage of tubular goods, many operators are keeping a closer check on the internal condition of tubing and casing in wells located in corrosive fields.

Tubing corrosion surveys by Otis Pressure Control are made under full shut-in well pressures and do not necessitate killing the well or pulling the string for surface inspection. Experienced Otis Caliper crews, including an engineer and wire line specialist, are available for immediate dispatching from 11 Otis offices. Crews can submit a preliminary interpretation of the general condition of the string and a list of bad joints immediately after the well is calipered. Otis crews have a complete set of calipering instruments to survey all standard sizes of tubing from 1½-in. to 4-in., and casing from 5½-in to 8⅝-in. As many as 30,000 feet of tubing can be surveyed in a single day's operation. Literature containing complete details is available from any Otis office.

The oil industry has told Wa... that it will need 17.5 per cent ... in 1951 to expand produc... and distribution faci... meet increased ... fined produc...
The incre... revealed ... mittee o... and pa...
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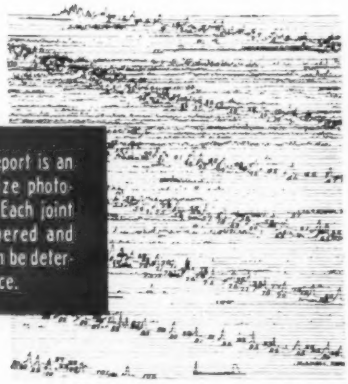
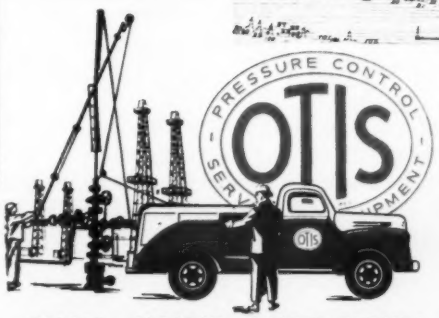
Closely-spaced spring-loaded feelers press against the inside area of the pipe wall; when a corrosion pit is encountered, direct action causes a rotating stylus to plot the location on a metal chart inside of the Caliper. The depth of the pits determines the extent of the log marks.

Included in each well report is an easy-to-read, double-size photostat of the Caliper log. Each joint in the string is numbered and badly corroded joints can be determined at a glance.





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where

p = porosity in per cent
n = empirical factor relating to degree of cementation of the sand, ranging from about 1.3 for unconsolidated sands to about 2.5 for highly cemented sands, in Southwest Texas
$F = R_o/R_w$ = formation factor
R_o = resistivity of the sand 100 per cent saturated with water
R_w = resistivity of the water.

Usually, R_o can be read from the log of the well, or from that of an adjacent well. If R_w is not available directly, it can be calculated from Equation 1 by estimating K.

It is apparent that the estimation of porosity requires the use of several judgment factors and that the selection of the wrong factors will alter the results appreciably. The only solution to this problem is to acquire sufficient history and data to enable the choosing of factors that will be applicable and that will yield acceptable results.

Resistivity Curves

The resistivity curves are recorded on the right-hand side of the log and are indicative of the resistance of the formation to the passage of electrical current. The early logs showed only one shallow-penetration curve, but later, deeper-penetration curves were added to overcome the effect of mud-filtrate invasion near the face of the well bore. Now, most logs show three or four resistivity curves.

The depth of lateral penetration of the resistivity curves is controlled by the electrode spacing and arrangement. The most commonly used spacing gives a penetration, from the face of the well bore, of about 2½ ft. for the first or normal curve, shown as a solid line; 10 ft. for the third curve, shown as a dotted line; and 25 ft. for the fourth curve, shown as either a long dashed or solid line. Sometimes an amplified curve is shown also. This is merely one of the other curves, usually the normal, recorded to show the same values as its parent curve, but on a larger graphic scale which makes details more vivid.

The normal curve is a two-electrode curve, while some logging companies use a two-electrode setup and others a three-electrode for the third curve. The fourth curve is a three-electrode curve.

The value shown on the log is not the true value of the resistivity of the formation, but an apparent value which is influenced by several factors such as resistivity of the mud, the thickness of the bed, and the extent of mud-filtrate invasion. The true resistivity of the formation depends upon five things: (1) the porosity, (2) the percentage of the pore space occupied by water, (3) the salinity and (4) temperature of the water, and (5) the degree of cementation of the sand.

Since mud in the hole is an indispensable adjunct to rotary drilling, all resistivity measurements must include the mud as part of the electrical circuit. As a matter of fact, if the mud were not present, some other form of contact would be necessary to close the circuit, and it would possibly be less satisfactory than mud.

For obtaining the true formation resistivity, the logging service companies have devised what is known as resistivity departure curves. These curves are plotted on log-log paper and relate all the pertinent factors affecting the apparent resistivity to the ratio of true resistivity to the mud resistivity. By choosing the proper curves to fit the known conditions, this ratio is obtained, and since the mud resistivity is known, the true resistivity is readily calculated.

Of what use is the true resistivity after it has been determined? A valuable use is in furnishing an unadulterated, true value of an important property of the formation for comparison with the same property in other formations on which we have more information.

Determination of Connate Water

And when the porosity, cementation factors, and connate-water re-

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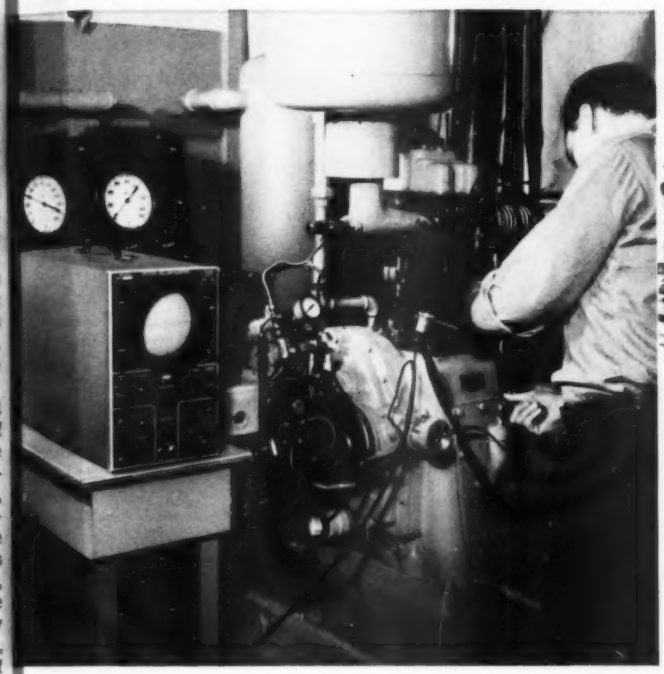

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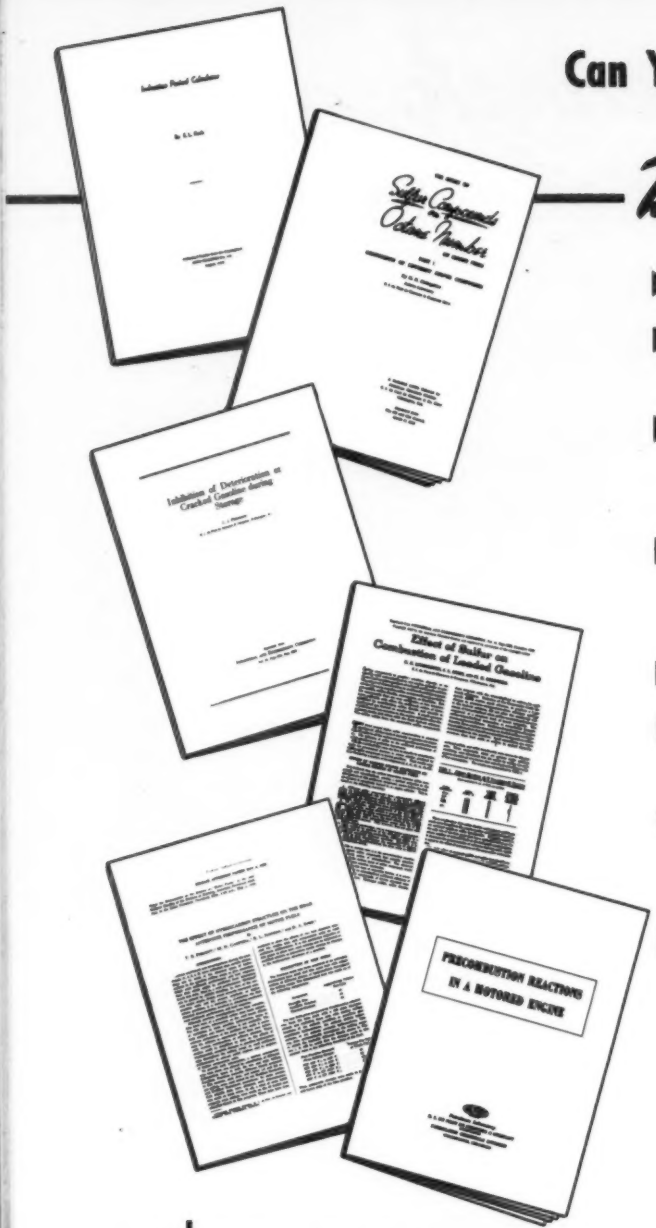

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sistivity are known, the true resistivity provides a means of calculating the water saturation at any level in an oil or gas reservoir. Probably its widest application is in the determination of connate water saturation from the well-known relationship:

$$W = \sqrt{R_o/R_t} \qquad (3)$$

where

W = per cent water saturation

R_o = true resistivity at the zone of 100 per cent water saturation

R_t = true resistivity in the oil or gas zone.

Of course Equation 3 will only be good for formations in which the porosity, cementation, salinity, and temperature factors are constant, leaving the degree of water saturation as the only variable affecting the resistivity, and hence it must not be used indiscriminately. On sands thick enough for the full apparent resistivity to be developed, and by using electrode spacings long enough to eliminate filtrate invasion as a factor (usually the third curve with approximately 5-ft. spacing) apparent resistivities may be used in lieu of the true values, inasmuch as the values will be very close to each other.

The determination of true resistivity is not a job that can be handled conveniently at the well location at the time the electrical log is run. Unfortunately, important decisions concerning the future conduct of the work on the well often must be made immediately after the log is available. As a basis for decisions, the operator must rely upon the information that is available and use the recorded apparent resistivities, with mental corrections applied as his experience dictates.

Resistivity Variations

Temperature affects the apparent resistivity more than is generally realized. It accounts in part for the lack of outstanding resistivity kicks on some of the deeper producing sands. Charts are available for determining the resistivity of sodium chloride solutions at various concentrations and temperatures, and should be used for accurate comparisons. For rapid estimates, an approximate inverse relationship may be used between resistivity and temperature, so that doubling the temperature (°F.) cuts the resistivity in half.

Most resistivity calculations are based upon the fluids, both formation and mud, behaving substantially as though they were solutions of sodium chloride. While this assumption is not strictly accurate, it suffices for most field and general uses. The resistivity of a solution varies inversely as the salt content, roughly to the extent that doubling the salinity (p.p.m.) cuts the resistivity in

(Continued on page 93)

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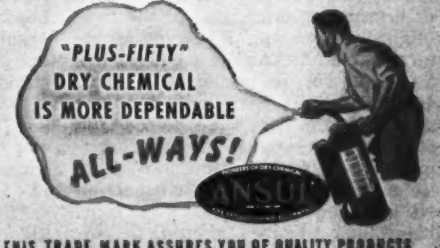

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Care of Wire Rope

We seem to be buying a lot of wire rope. Can you direct us to instructions for handling the cable?—F. C. E.

Nearly any of the manufacturers of rope will be glad to furnish instructions. As one example, the wire and rope division of Jones & Laughlin Steel Corp. has instructed somewhat as follows:

You should be careful to avoid kinking when unreeling or uncoiling wire rope, since kinking leads to early rope failure. Whenever possible, it is advisable to take the rope directly from the reel onto the drum, being sure to keep the same direction of bending, because reverse bending will injure the rope. A grooved drum is recommended, as it usually permits installation from one side and in one direction only.

If a smooth drum is used, care must be taken in spooling to avoid kinking, pressing, or wedging, all of which shorten rope life. The wire rope is spooled on a smooth drum it tends to roll in the opposite direction from the lay—a right-lay rope, for example, rolls to the left. For efficient spooling, a right-lay rope spooling over the top of the drum should be started from left to right, while a left-lay rope should be started from the right. This keeps the coils firmly together and gives proper support for each layer of rope.

Care must be exercised when putting a new rope into service. A few preliminary trips through the working cycle at slow speeds will set the strands more firmly in place and will also give the operator a chance to see that the drums and sheaves are operating properly and are fitted to the new rope. Maximum service calls for smooth, steady application of power. Sudden acceleration, shock loading, or excessive vibration will shorten rope life.

Lubrication is as vital for wire rope as it is for any other machine. For lubricating wire rope in the field a light, penetrating lubricant is required. The lubricant can be brushed on, poured on, or applied in a bath when conditions permit. For proper lubrication, the wire rope should first be cleaned thoroughly and the lubricant must have ample time to soak in.

Regular and frequent inspection will lengthen the life of wire rope. Drums and sheaves should be inspected frequently, since scored drums and battered lagging will impair rope service, and worn filler and riser strips will cause kinking and improper crossover. Broken or scored sheaves will damage the outer wires of the rope, while worn sheave guards may allow a rope to jump and cause an expensive and possibly serious accident. Also check on the rope itself, as certain sections may get more wear than others. Because of these wear points, it is advisable to shift the rope at frequent intervals to distribute wear.

It is vitally important to know when to replace wire rope. The estimate should be based on the number of broken wires in the rope lay, and the condition of the remaining wires. One way to arrive at a safe practice is to set an arbitrary maximum number of broken wires, and then remove the rope from service for an ultimate strength test. The arbitrary figure can then be revised and rechecked until a practical working guide is arrived at.

In corrosive atmospheres, the use of low-alloy steel wire in the cable may be worth consideration. J. C. Hudson points out in the November 1948 issue of the Journal of the Iron and Steel Institute, that small amounts of copper and in some cases chromium greatly lengthen the life of wire.

Composition of Gases And Crude Oil

What I am after is the name of a book or other authority which would give me the composition or formula of casing-head gas and crude oil, that is, an authority which will tell me how many atoms of carbon and the atoms of other ingredients in casing-head gas and crude oil?—A. H. F.

Natural gas and the natural (or casing-head) gasoline extracted from it consists almost totally of the paraffin and isoparaffin series of hydrocarbons. The chemical behavior of this most common series of hydrocarbons can be found in any elementary organic chemistry text book. They are extremely stable from a chemical standpoint, or in other words they are unreactive and hence little will be found. The chemical properties and the nomenclature of such hydrocarbons are discussed briefly on pages 12-15 of Reference 1.

The much more extensive data on the physical properties of these hydrocarbons may be examined on pages 35-42 and 53-118 of Reference 2, pages 150-151, 172, and 176-179 of Reference 1, or best of all, pages 2-3 and many other parts of Reference 3.

The amount of each hydrocarbon in a gas can only be determined by analysis and there are so many thousands of commercial gases that tabulations of the compositions of gases are seldom made except as illustrations. Discussions of gases and casing-head gasoline and a few tabulated analyses appear in Reference 1 pages 361, 717-726; Reference 4 pages 21-28, and Reference 5 pages 22-25 and 32-37. Most generally, the gases from gas fields contain large amounts of the typical gases such as methane and ethane, whereas gas from the casing head of an oil well or the gas associated with oil contains sizable amounts of readily liquefiable hydrocarbons such as propane, the butanes, and the pentanes. The so-called "distillate well" gases may contain even larger amounts of the higher boiling or liquefiable gases. Finally, the gases collected from crude oil or gasoline storage tanks is the richest of all, containing even 10 gal. per 1,000 cu. ft. of condensable gases.

The complexity of crude oil militates against brief discussions, but something of the composition can be learned from pages 17-20 and 85-100 of Reference 1, pages 42-118 of Reference 2, pages 197-251 of Reference 5, and pages 28-48 of Reference 4. Many years are required to completely analyze a crude oil for the thousands of hydrocarbons that may be present, and in fact an entirely complete analysis has never been completed on any crude oil.

It is regrettable that a single reference cannot be suggested. Each of the references recommended here approaches the question from a different standpoint.

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Earthquake Damage

(Continued from page 63)

unconventional as regards size, weighing 1,710 lb.

Drilling mud.—In all operations described above, clay-base mud is used as the drilling fluid except wells in which coring, testing, etc., are to be done above the casing point. Four or 5 days are normally required for the hole-opening operation. Investigation of vertical drilling-fluid velocities in the 26-in. diameter hole was made prior to acceptance of the program. This indicated that velocities as low as 0.4 ft. per second could be expected if standard pump sizes and rates were used. Since this figure is low when compared to accepted standards, experiments were conducted by adding an extra pump to the system.

Subsequent experience, however, has shown that maintenance of drilling fluid in good condition, not velocities, is the primary factor, and very little difficulty has been encountered in this regard. Caliper logs of the large-diameter hole were made in a number of the first wells drilled in this fashion, and it was found that the hole diameter was satisfactory so long as good mud control was used.

Directional control.—Many of the wells drilled in this fashion are directionally controlled. Where possible, the well is designed so that directional work will not be done in the hole which is subsequently to be opened to 26-in. diameter. However, in some instances, wells have been kicked off in the hole which is subsequently opened, and directional work done without difficulty; no difficulty has been encountered opening the hole.

Setting and Cementing Casing

After conditioning the hole, casing is set and cemented in normal fashion. A port collar is installed approximately 10 ft. below the bottom of the 26-in. diameter hole. The cement is calculated to fill to the port collar. Difficulty was encountered early in the program preventing cement from channelling into the large hole, although no large quantities of cement above the port collar were found.

Two methods of controlling the height of rise of the cement have been used with excellent results. First, a series of cement slurry mixes of graduated weight and viscosity were evolved. Each was selected largely on the basis of the height to which the cement had to be pumped. Bentonite-type clays and "exploded" perlite have been used to obtain desired slurry weights and viscosities. Secondly, the rate of displacement of the cement was increased considerably above normal practice. Temperature surveys indicated that a deviation of approximately 4 per cent between actual and calculated rises has been

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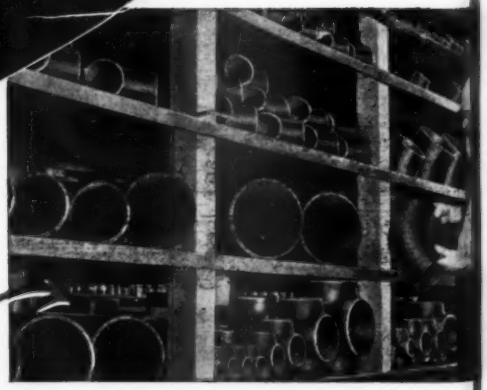

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attained in most cases since the changes were made.

After displacement of the cement, the port collar is opened as soon as practicable and the annulus circulated thoroughly with clay-base mud. The mud is treated if necessary in order to condition the annulus for placement of the special packing material.

The annulus is then completely displaced with an emulsion-type mud which is treated to obtain a very low water loss and an extremely high gel strength. After complete gellation, the consistency of the mud pack is such that a pencil thrust into it will remain upright indefinitely. Measurement of the gel strength is made by use of a specially modified shearometer tube. The success of the program is demonstrated by the fact that less than 94 per cent of the calculated displacement volume has been placed in only a very few cases. In some cases, 106 per cent of the calculated displacement volume has been reached.

After completion of the above work, the well is completed in normal fashion.

The uppermost sediments on the Union Pacific property, to a depth of approximately 1,450 ft., are comprised largely of clay and silt members and medium to coarse-grained unconsolidated sands. Since the entire program is predicated on maintenance of the large hole diameter in order to permit earth slippage without transmittal of large localized stress concentrations, it is essential that the diameter of the hole be maintained. In order to determine the effectiveness of the fluid used in the annulus in this regard, the annuli are refilled periodically, and a program of thief sampling of the fluid has been instituted.

Recovery of Damaged Wells

Following the earthquake, remedial and recovering processes were evaluated both from the point of view of mechanical effectiveness and of economics. A series of experiments were conducted both on surface test specimen and on wells (Fig. 1). From these, it was concluded that any attempt to repair wells from the "inside" (i.e., milling, swedging, etc., inside the casing) was unlikely to succeed due to the unique type of deformation encountered. The lateral slippage spoken of above usually results in the offsetting of two more or less parallel limbs of the casing. (See Fig. 2.) As a result, attempts to remove the constriction by milling or swedging almost invariably results in cutting or breaking the side wall or pipe, thus permitting the tool to follow a prolongation of the axis of the upper limb, rather than the axis of the bend.

A specially designed flexible drill collar and rotary-bit-type swedge were used to open severe constrictions in a test specimen to approximately normal internal diameter. A subsequent attempt to use this equipment to restore normal internal diameter in a well casing was abandoned because of slow progress. As a result, emphasis was given to other methods.

In order to provide the maximum amount of protection against potential earthquake damage, new wells designed to replace many of the wells which are completely unproducible have been drilled. A number of these have been completed and others are now being drilled.

At the same time, special tools were designed and built for washing over and recovering casing as large as 11¾-in. o.d. These consist of specially built drag-type and roller-cutter-type washover shoes, heavy-wall 16 and 30-in. washover casing fitted with tool joints, an external casing cutter and a flexible section of washover casing. (See Fig. 3.) The latter is made of a series of interlocking cast-steel rings; the joints permit a deflection of approximately 2 ft. laterally at the bottom of a 10-ft. section of the casing. (See Fig. 4.) Each joint is sealed with a rubber insert sleeve so that circulation can be maintained through the section.

To date, three wells have been worked on with this equipment. One has been completely recovered; another was washed over to the 1,700-ft. level below which the well was deflected and redrilled. The third has been washed over to the 1,700-ft. level. The condition of the casing recovered by the use of this equipment indicates that the casing failures have been due to local concentrations of very large stresses. While some plastic deformation above and below the point of failure can be seen, the failure itself in one case exhibited characteristics more nearly associated with the result of high-velocity shock wave than with the result of a relatively slow bending process. (See Fig. 5.)

In designing surface equipment for installation in wells in which the 26-in. diameter hole is to be drilled, the use of this special washover equipment for economic recovery of wells which may be damaged by future earthquake action was considered. Thus, the size of the surface casing was determined by the size of washover tools and pipe, since in the case of the wells which have been washed over to date it was found that removal of drive pipe and surface casing was costly and time consuming.

Since the final test of the effectiveness of the program for preventing or minimizing earth slippage damage to the wells necessarily involves the occurrence of another earthquake, a full evaluation of the program is not now available. However, theoretical evaluations of the program are being made and changes introduced as they are deemed necessary.

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LOUISVILLE 1, KENTUCKY

Scurry Field Has 2½ Billion Barrels

Testimony at Texas Railroad Commission shows 2.4 to 2.76 million barrels of stock-tank oil originally in place at Kelly-Snyder field

The Journal has published many articles on the Kent-Scurry-Borden counties Pennsylvanian Reef oil fields of West Texas. Important reservoir engineering data and material balance calculations, in particular, appeared in the issues of April 27, 1950, pages 64-65, and May 11, 1950, pages 85-86.

At the recent hearing of the Texas Railroad Commission at Austin, November 3, on the Scurry fields, additional information and bottom-hole-pressure data were presented (see Journal issue of November 9, 1950, pages 65-66). At the Austin hearing informative testimony on Kelly-Snyder field was given by Charles Phillips, petroleum engineer with Standard Oil Co. of Texas. Phillips' findings are reproduced in the accompanying report; they show that material-balance calculations for Kelly-Snyder field give a value of 2.4 billion stock-tank barrels for the original oil in place, a quite satisfactory comparison with the figure of 2.76 billion barrels of original oil in place as obtained by volumetric computations.

A GENERAL outline of the method used to make a comparison between the theoretical performance and the actual performance to date of Kelly-Snyder field, Scurry County, Texas, and the benefits expected to be derived from such a comparison, are given below.

Material-Balance Calculations

From an observed reservoir pressure at any given time for a dissolved-gas-drive reservoir with no original gas cap, and knowing the cumulative production and cumulative average gas-oil ratio to that time, and knowing the characteristics of the reservoir fluid, it is possible by means of the material-balance equation to calculate a value for the original oil in place. In this particular calculation, it is **not** necessary to make any assumptions regarding the effect of gravity, pressure differentials across the field, relative permeability to gas, etc.

The calculation pertains only to past observed history, and if there had been any effects of gravity, pressure differentials, etc., they would have been reflected in the observed pressures and gas-oil ratios. It is necessary to assume only the validity of the law of conservation of matter, that the observed data are correct, and that the volume of the reservoir is constant.

A comparison of the value of original oil in place thus obtained with a value obtained independently by the volumetric method is informative, and if the two methods give values that agree reasonably well, it indicates that the actual reservoir performance has been just about what would be expected from the data, and that the assumptions made in making the calculations were valid. It is not believed to be at all "alarming" to find in this manner evidence that the law of the conservation of matter applies to an oil reservoir, that the fluids are behaving in the reservoir as the bottom-hole sample behaved at the same temperature and pressure in the laboratory, that the reservoir volume has neither expanded nor contracted . . . and, consequently, that the reservoir pressure has declined an observed certain number of pounds with the production of a given number of barrels of oil.

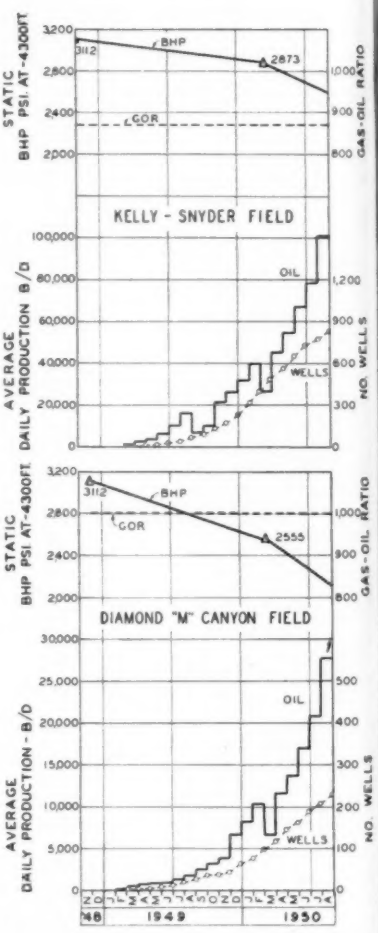

Fig. 2—Production-pressure — gas oil ratio data for Kelly, Snyder, and Diamond M fields.

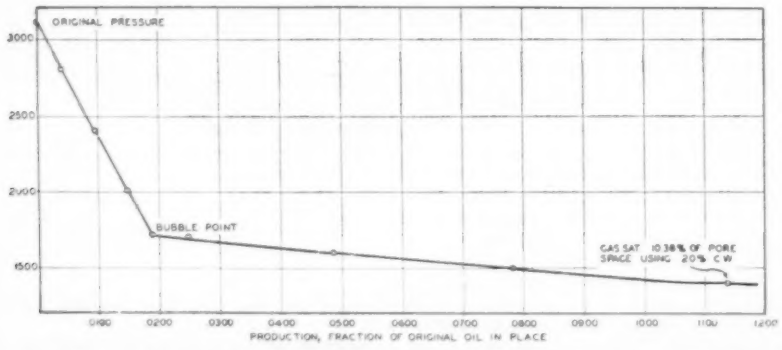

Fig. 1—Material balance calculations for North Snyder field (procedure discussed in Journal issue of May 11, 1950, pages 85-86).

Calculation, Using September 1950 Pressures

Such a calculation of original oil in place and a comparison with the value obtained by the volumetric method were made for Kelly-Snyder field, as follows:

	Psig.
Arithmetic average bottom-hole pressure at —4,300 ft., September 1950 survey, 802 wells	2,560
Volume-weighted average pressure, 795 wells	*2,579
Arithmetic average pressure, same 795 wells	2,559

Note: Volume-weighted average pressure

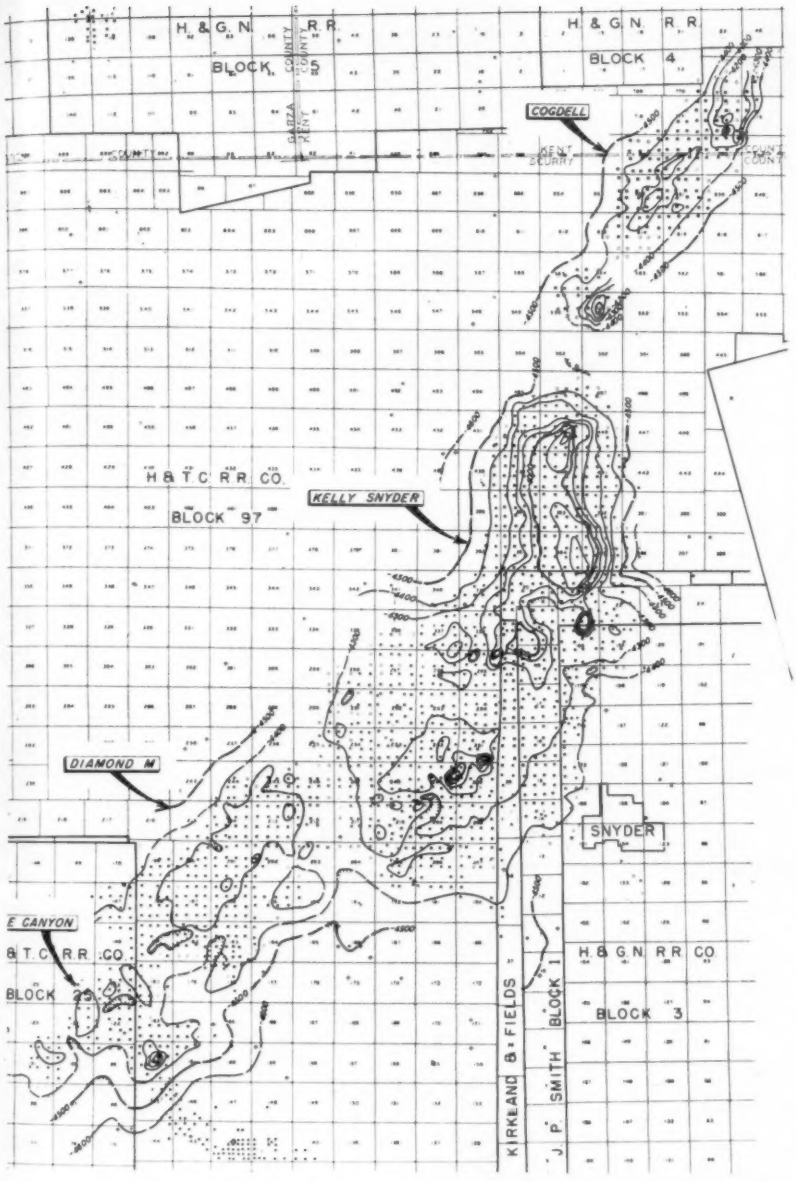

Fig. 3—Structural contour map on top of Pennsylvanian Canyon Reef, Scurry fields.

SCURRY COUNTY REEF FIELDS—WELLS PRODUCING WATER AND ON PUMP MARCH-SEPTEMBER, 1950

	Diamond "M"		Sharon Ridge		Kelly-Snyder	
	March	Sept.	March	Sept.	March	Sept.
Total wells (September 1, 1950)		226		91		827
Number wells producing water	0	10	0	6	11	36
Estimated daily water production	0	120	0	360	570	2,930
Number wells pumping	0	19	0	0	7	37
Number pumping wells producing water	0	4	0	0	7	19
Number wells producing water on pump	0	4	0	0	7	17
B.h.p. (arithmetic average)	2,555	2,086	2,942	2,716	2,873	2,560

is the summation of acreage times thickness times pressure for each well divided by the summation of acreage times thickness for the same wells.

*Seven wells for which no acreage or thickness were available were omitted from the calculation of volume-weighted average pressure.

From the curve (Fig. 1) of calculated bottom-hole pressure versus cumulative production, at 2,579 psig., it may be noted that the production, expressed as a fraction of the original oil in place, is 0.007. The cumulative production from Kelly-Snyder field as of September 1, 1950, taken from Texas Railroad Commission EB reports, is 16,815,771 stock-tank barrels. Dividing this by 0.007 gives a value of 2,400,000,000 stock-tank barrels for the original oil in place.

A volumetric estimate gives a figure of 2,760,000,000 stock-tank barrels. This is arrived at using 32,634 acres,* 9,207,320 gross acre-feet of pay (282 ft. average thickness), and 300 stock-tank barrels of original oil in place per gross acre-foot of pay (based on 8 per cent porosity, 25 per cent connate water, and 1.55 original formation volume factor).

Thus, the value for original oil in place calculated from the material-balance equation and the observed data is 2,400,000,000 stock-tank barrels, and the value obtained independently by the volumetric method is 2,760,000,000 stock-tank barrels. This is relatively close agreement. It is believed that the true reservoir pressure is somewhat higher than that indicated by the volume weighted average of the 72-hour shut-in bottom-hole pressures, due to lack of complete buildup in some of the wells. If this fact were taken into account, the agreement between the two figures above would be even closer.

The close agreement between the value for original oil in place calculated from the material-balance equation and the observed data (2,400,000,000 stock-tank barrels) and that obtained independently by the volumetric method (2,760,000,000 stock-tank barrels) indicates that the actual reservoir performance of Kelly-Snyder field has been commensurate with the fluid withdrawals.

*Only the developed wells, according to the September 20, 1950, Texas Railroad Commission proration schedule, were used both in making the volumetric estimate and in calculating the volume-weighted average reservoir pressure.

Fig. 4—Pressure recorders are used by Danciger Oil & Refining Co., to obtain continuous tubing and casing pressures on its flowing wells in the Kelly area, Scurry County.

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"JOE, THIS IS PETE ON THE R. TAYLOR. THIS COLD SNAP HAS PARAFFINED THE LEAD LINES HERE PLUMB SOLID. WHEN CAN YOU GET THE GANG OVER TO BUST 'EM OUT?"
"JOE, WE CAN'T GET IN TO PULL GLENNIS 12 TODAY —WE'RE STUCK ON THE AUSTIN."

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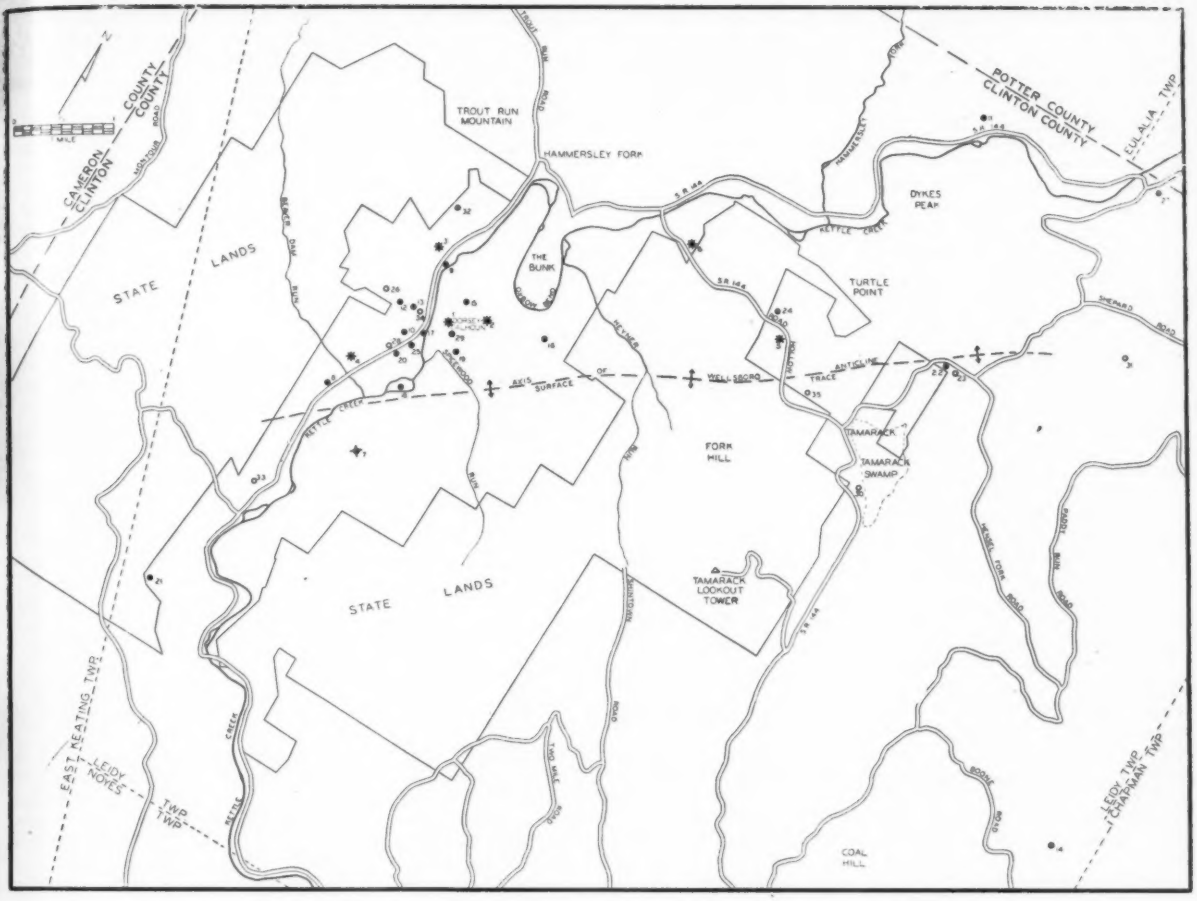

Fig. 1—Leidy gas pool area, Clinton County, Pennsylvania (Oriskany sandstone).

New Oriskany Sand Gas Pool

Pennsylvania discovery opens new pool with an estimated open flow of 17 million cubic feet daily from less than 1 ft. in the sand

by Q. L. Wilcox

THE search for production in the Oriskany has been long and widespread. Gas was first discovered about 1913 in northwestern Ohio in a locally named sandstone, later correlated with the Oriskany (as named for a Lower Devonian sand at Oriskany Falls, Oneida County, New York). From 1923 to 1927 Guernsey oil and gas field was defined in Guernsey County, Ohio—the only commercial oil field yet found in the Oriskany horizon. Attention was focused on this sand as a possible widespread reservoir rock by the discovery of large gas wells (up to 75,000,000 cu. ft. per day) in South Central New York and North Central Pennsylvania in 1930. Its potentialities were confirmed in West Virginia by Elk-Poca and Cabin Creek fields and their extension northward through still-active Kanawha, Jackson, Wood, and Wirt counties, and proved in southwestern Pennsylvania in Fayette County where gas was found in both the Oriskany and the immediately overlying Onondaga limestone.

Leidy gas field on the Wellsboro anticline in Clinton County, North Central Pennsylvania, is another prolific pool found in the Oriskany sandstone. It is significant for two reasons: first, it extended known gas occurrences southeastward in the state, creating a wave of leasing as far south as the Maryland state line; second, it brought the known occurrences closer to the Allegheny front and hence to the outcrop.

The author is geologist affiliated with the Pennsylvania Oil and Gas Management Associates, Oil City, Pa.

In North Central Pennsylvania, Oriskany gas has been found on domes on the en echelon Smethport, Hebron, Harrison, and Sabinsville anticlines. The domes have been reverse faulted with the strike of the faults generally and approximately parallel with the axis of the anticline. These faults usually control the accumulation of gas and salt water. Wellsboro anticline, en echelon equivalent of Sabinsville anticline to the north, was recognized as a prominent structural feature with several faulted domes and

was tested unsuccessfully in Potter County as early as 1931. Drilling along this anticline proceeded northeastward until some 15 dry holes were completed and the most favorable appearing "highs" had been condemned. The last test was completed in 1949 in Delmar Township, Tioga County. Meanwhile, East Fork-Wharton Oriskany gas field in Potter County, opened in 1933, had been extended southwest and drilled into major proportions. This field is less than 10 miles north of the Leidy area. Shallow gas had been discovered here in 1864,[1] and by 1923 some 18 wells were producing from around 1,000 ft.

Development of the new pool.—When the shallow horizon described above proved dry in Leidy Prospecting Co. 1 Dorsey Calhoun, ¼ mile from the town of Leidy, geologists encouraged the group to continue drilling until the Oriskany was reached at a depth of 5,659 ft. Early this year the well opened the new pool with an estimated open flow of 17,000,000 cu. ft. of gas daily from less than 1 ft. in the sand. Initial rock pressure was reported as 4,200 psi.

The second development was completed by the same company last June, and up to September 15, seven completions have been noted in the field. Of these only one encountered salt water in the pay zone. While this test was well down on the south flank of the structure, successful producers have been finished structurally lower on the north flank, although these were not necessarily in the same fault block. Conceivably the field could extend farther southeastward as, in the Oriskany pools in Tioga County, salt water was found in wells near the fault zones downstructure in the fault block.

The completed producers range in size from 3,000,000 to 50,000,000 cu. ft. of gas per day. However, all of the wells have a potential greater than indicated because no well has gone deeper into the sand than about 6 ft. The field as already proven is at least 6,000 ft. wide and 4 miles long. Ventures now in progress should extend it by another 3 miles in the near future, and many observers believe this may become one of the largest fields in the state, if not in areal extent at least in reserves. At this writing, 18 wells are drilling and 15 locations have been made.

Approximate locations of all but the newest wells are shown on Fig. 1. Also shown are the boundaries of lands owned by the Commonwealth of Pennsylvania, to which mineral rights are to be sold soon. Acquisition of these rights will permit extension of the field southwestward, as well as drilling of the gap between the discovery well and the New York State Natural Gas Co. 1 Daugherty, slightly more than 3 miles to the east. The Daugherty was the largest well yet completed in the field, gaging an open flow of 50,000,000 cu. ft. daily. Table 1 shows the operator, lessee, and status of the wells as of the middle of September. The map number given is crossreferenced on Fig. 1. Location No. 14 on the figure, included in Leidy pool although 8 miles distant, is not thought to be on the same structure with the other wells and may be testing the plunging nose of the Slate Run anticline which in turn may be part of the Laurel Hill anticline.

TABLE 1—LEIDY POOL WELLS AS OF SEPTEMBER 15, 1950

No. on Fig. 1	Well name—	Top pay (ft.)	IP (M.c.f. gas)	IRP (psi.)	Status (ft.)
1	Leidy Prospecting 1 D. Calhoun	5,659	27,000	4,200	Comp. TD 5,662
2	Leidy Prospecting 2 D. Calhoun	6,172	30,000	3,825	Comp.
3	Roeder & White 1 H. Ludy	5,925	3,020	3,950	Comp. TD 5,928
4	G. L. Cabot, Inc. 1 J. Calhoun	5,804	8,740	4,100	Comp.
5	N. Y. S. Natural 1 R. Daugherty	6,085	50,000	4,160	Comp. TD 6,086
6	Fralich et al 1 W. Summerson	6,294	3,800	4,040	Comp. TD 6,301
7	Fairman & Miller 1 E. E. Summerson	....	Salt water	....	Comp.
8	Hopkins & Layton 1 H. Summerson	....	....	....	Drilling
9	Fralich et al 1 A. Wykoff	....	....	....	Drilling
10	G. L. Cabot, Inc. 1 Repetto	....	....	....	Drilling
11	G. L. Cabot, Inc. 1 C. Foley	....	....	....	Drilling
12	N. Y. S. Natural 1 E. Connell	....	....	....	Drilling
13	N. Y. S. Natural 1 J. McCoy	....	....	....	Drilling
14	E. P. Sheridan 1 H. Martin	....	....	....	Drilling
15	N. Y. S. Natural 1 H. Proctor	....	....	....	Drilling
16	N. Y. S. Natural 1 E. Daugherty	....	....	....	Drilling
17	Ed Wade et al 1 R. McCoy	....	....	....	Drilling
18	G. L. Cabot, Inc. 1 J. J. Calhoun	....	....	....	Drilling
19	Leidy Prospecting 3 D. Calhoun	....	....	....	Drilling
20	Roeder & White 1 V. McCoy	....	....	....	Drilling
21	Mid-Atlantic Oil & Gas 1 Homeward	....	....	....	Drilling
22	G. L. Cabot, Inc. 1 F. Wykoff	....	....	....	Drilling
23	Fralich et al 1 C. Johnson	....	....	....	Moving in
24	Roeder & White 1 F. Daugherty	....	....	....	Drilling
25	Noiley Development 1 F. Pelkey	....	....	....	Drilling
26	Leighton & Christman 1 E. Schoonover	....	....	....	Location
27	Renova Oil & Gas 1 L. Green	....	....	....	Location
28	Keta Oil & Gas 1 C. Cross	....	....	....	Location
29	N. Y. S. Natural 1 C. Summerson	....	....	....	Drilling
30	N. Y. S. Natural 1 H. Finnefrock	....	....	....	Location
31	Bluerock Drilling 1 Gottshell	....	....	....	Building rig
32	G. L. Cabot, Inc. 1 H. Stahl	....	....	....	Moving in
33	Sheer & Kane 1 Doebler	....	....	....	Location
34	Roeder & White 1 D. Schoonover	....	....	....	Location
35	Pomeroy et al 1 Daugherty	....	....	....	Moving in
..	N. Y. S. Natural 1 G. Cross	....	....	....	Location
..	N. Y. S. Natural 2 E. Connell	....	....	....	Location
..	G. L. Cabot, Inc. 1 L. Jacobus	....	....	....	Location
..	Leidy Prospecting 1 M. Calhoun	....	....	....	Moving in

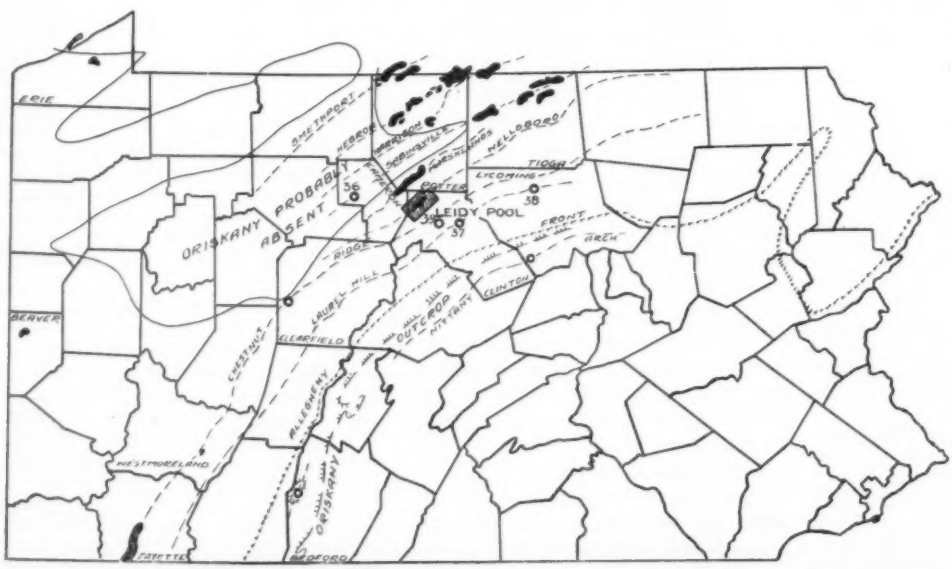

Fig. 2—Map of principal geologic structures in North-Central Pennsylvania with Oriskany sandstone gas fields.

Stratigraphy of the area.—In Leidy field the Oriskany sandstone, when completely drilled, should prove to be lithologically much the same as that in the other North Cen-

tral Pennsylvania pools. Fettke[2] has described this as a hard, tight sandstone composed of exceptionally pure quartz grains which are angular or subangular, the angularity being due to secondary crystalline outgrowths and secondary cementing of silica. The sandstone gains part of its permeability, at least in the producing fields of the Appalachian foreland, from fractures inherent from anticlinal folding and faulting.

The Oriskany is Lower Devonian in age, rests disconformably on the Helderberg limestone of Silurian age, and is overlain unconformably by the Onondaga limestone of Middle Devonian age. Its thickness in the Leidy development has not been determined nor has it been measured at the outcrop. However, the overlying geological section has been measured at Lock Haven in the southeastern part of the county, and as wells in the Leidy pool commence in the lower Catskill or upper Chemung formation,[3] the Devonian section in the interval from surface to the Oriskany is here summarized:

Formation—	Thickness in ft.
Catskill	....
Chemung-Portage	3,314
Genesee	560
Hamilton	1,131
Marcellus	759
Oriskany	....
Total	5,764

Reservoir pressures.—The rock pressure has been approximately the same for all Leidy wells, which tends to indicate a continuous reservoir. The average 4,200 psi. is greatly in excess of the normal for this depth, and there have been several possible reasons advanced for this anomaly. The first is that the original overburden prior to erosion was sufficient to create this pressure and there has been no escape since the overburden was removed. Or the height to which the beds were raised during the Appalachian Revolution could have made such a hydrostatic head possible by surface-water encroachment from the outcrop. Another thought is that the pressure, as well as the gas, is inherent from deep-seated horizons through faults which penetrate either the regional unconformity between the Middle and Lower Ordovician or the Gatesburg sandstone below it. In the latter case, however, it does not seem probable that faulting which would permit gas to reach the Oriskany would not permit it to escape above that level. It may be that the cause is from diastrophism in post-reservoir time, compressing the gas by compaction of the sand or of the effective reservoir itself. Again it may be that secondary silication and crystallization within the sandstone has reduced the pore space available for storage, thereby creating the extraneous pressure.

Important tests outside the Leidy area.—Fig. 2 shows the en echelon nature of the principal structures and the alignment of the exploited fields in relation to them. Location No. 36 on this figure will be drilled by New York State Natural Gas Co. and Sylvania Corp. on what may be a continuation of the Sabinsville anticline. It is shown as being within the area where the Oriskany was once postulated to be absent. However, the sand limits have been reextrapolated here and it is likely that the zone will be found present. Smith & Shaw are testing the Hyner dome of Laurel Hill anticline at location No. 37, with 7-in. casing cemented in the Onondaga limestone in the 1 Harman. If this well comes in it will extend the gas area considerably to the southeast and encourage operations on the smaller Ferney anticline near to and paralleling the Hyner structure.

Interest is also centered around the Cogan House dome on Laurel Hill anticline, where Godfrey L. Cabot, Inc., is rigging up at location No. 38 on Fig. 2. Location No. 39 will be drilled by Kelly et al on the Grant Stout lease; structurally this location appears to be between the Hyner dome on the south and the Clearfield syncline on the north.

Disposition of the gas.—New York State Natural Gas Co. will take most of the gas from Leidy pool, and is laying a 16-in. line to Sabinsville to connect to transmission lines to points in New York. Meanwhile a National Transit Co. oil line which crosses the pool area has been leased by the same company to take gas from some of the wells to existing facilities in McKean County. Godfrey L. Cabot, Inc., the only other interested major gas company, presumably will lay a main line to the field.

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1. M. E. Johnson, Progress Report 78 (1923), Pa. Geol. Sur., "Gas in Leidy Township."

2. C. R. Fettke, Vol. 22, Bull. A.A.P.G. (1938), "Oriskany as a Source of Gas and Oil in Pennsylvania and Adjacent Areas."

3. Ibid.

Well-Site Interpretation Of Electric Logs

(Continued from page 83)

half at the concentrations and temperatures prevailing in practice.

Thin sands, especially if they are shaly, have much lower apparent resistivities than do thicker ones. The resistivity values shown on the log for thin sands are related to the electrode spacing.

In the case of two-electrode curves, sands thinner than the electrode spacing show a reversal rather than a kick for resistive sections. This reversal may be rather sharp, as at A in Fig. 4, which is a good oil sand, or it may be only a slight dishing as at A in Fig. 5, which is also a good oil sand, slightly thicker than the first example.

Extremely thin sands may fail to show at all except as a reversal on the short normal and as a rather vague kick on the fourth curve. Examples are shown at B and C in Fig. 5. Cores showed about 6 in. of oil sand at each of these places. Note the reversal on the amplified normal curve, which was run with a 16-in. electrode spacing. Incidentally, many good strand-line wells are completed in only 6 in. of sand.

The deep-penetration or fourth curve has the characteristic of "shadowing out" part of the formation immediately below (or above, in the case of reverse spacing) highly resistive streaks. This is caused by the resistive formation insulating the lower electrodes from the upper one and reducing the flow of current for a distance approximately equal to the spacing. At least one major company overcomes this difficulty by making two runs with the logging equipment, reversing the position of the pickup and current electrodes on the second run. By combining the two logs, the shadowing is eliminated.

The B sand in Fig. 4 is a good example of shadowing out of the fourth curve. The top 4 ft. of B is a prolific oil zone, yet the fourth curve shows no kick at all because the resistive A sand has blocked the current flow. As a coincidence, the third curve at B exhibits very little character because the sand is too thick to show reversal and too thin to develop a kick. Since B was not cored or tested, it is possible that it would have been neglected as a source of oil, if the operator had not understood the characteristics of the curves well, and had the fortitude to try it.

BOOKS

SYMPOSIUM ON HIGH-ADDITIVE-CONTENT OILS. Published by the American Society for Testing Materials, 1916 Race Street, Philadelphia. 68 pp. $1.75.

The lubricating oils considered in this symposium are of an entirely new type and differ from the previous heavy-duty oils in that they contain from 5 to 10 times as much additive. Developed to meet a field condition involving severe operation of engines using high-sulfur fuels, the success of these oils led investigators to determine if other problems such as sludging and piston-valve deposits in other than tractor engines could also be corrected by the use of these oils. The symposium, sponsored by the A.S.T.M. Committee D-2 on Petroleum Products and Lubricants, was presented at the first Pacific area national meeting in San Francisco in October 1949.

THIRTEENTH TECHNICAL CONFERENCE ON PETROLEUM PRODUCTION, in Cooperation with the Pennsylvania Grade Crude Oil Association. Published by Pennsylvania State College, School of Mineral Industries and Experiment Station, State College, Pa. 218 pp. $3.

The conference with which this volume is concerned was attended by 170 representatives of the oil industry and public institutions interested in the problems of petroleum production. Eleven states were represented. Eleven papers are presented, covering a wide range of subjects.

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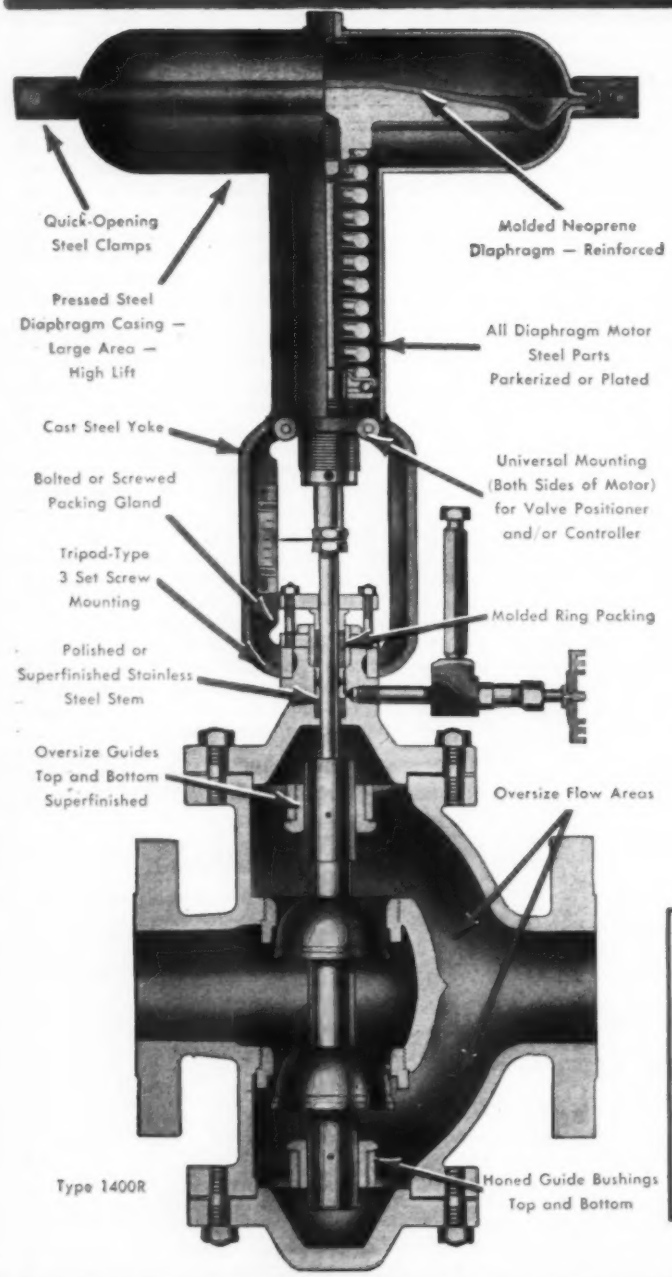
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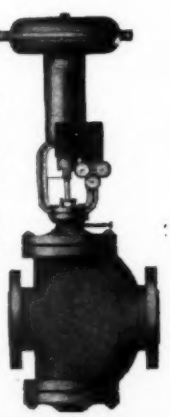

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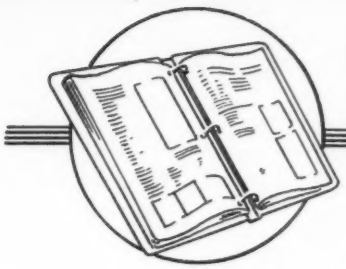

THE REFINER'S notebook

Three-Function Response*

THE purpose of this paper is to outline an improved control system which incorporates three control effects in such a way that automatic reset can be used while overpeaking on startup is avoided. While the undesirable overpeaking characteristics on startup of batch processes may be selected as the best method of illustrating the improved performance of this new control system, there are many actions in continuous processing, sometimes leading to upsets, which are equally difficult to handle. Typical of these are the excursion of the controlled variable beyond the control band for extended periods due to "no load" or "excess load," and the manual shifting of the set pointer. In last week's installment, response of conventional controllers of the (1) proportional, (2) proportional - plus derivative, and (3) proportional-plus reset types was reviewed, particularly with reference to startup characteristics.

Conventional controller with three responses.—When the proportional, derivative, and automatic reset functions are incorporated in one controller in the conventional fashion the startup characteristic may be very similar to that illustrated in Fig. 1A. Note

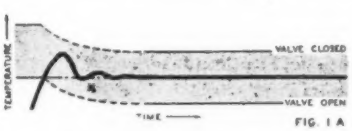

FIG. 1 A

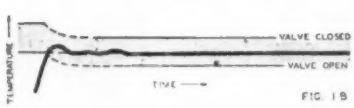

FIG. 1 B

that the automatic reset function still dominates the proportional band and places it above the control point during the startup period. Since the derivative function does not begin to act until the control point is reached overpeaking is reduced but cannot be avoided. As is frequently the case when the derivative is used, the proportional band can be narrowed and a further reduction in overpeaking may be accomplished as shown in Fig. 1B.

Fig. 2 is a schematic diagram of the circuit used in some of the existing conventional controllers. As the temperature increases, the Bourdon tube moves the baffle toward the nozzle, increasing the back pressure and actuating the relay valve. Since the relay is reverse acting, the output pressure diminishes. If the reset restriction "R" is closed (R = 0) and the derivative restriction "T" is open (T = 0), and falling output pressure on the right side of the bellows moves the nozzle to the right thereby causing the nozzle to move along with the baffle. Now, if for a given pressure change on the right side of the bellows, the nozzle movement is large due to the sensitivity adjustment "S," the instrument sensitivity is low and its throttling band is wide. On the other hand, if the nozzle motion for the pressure change is reduced by the sensitivity adjustment "S," the controller sensitivity is high and the throttling band is narrow The automatic reset feature is added by opening the reset restriction "R" so that over a period of time, this pneumatic sensitivity reduction is canceled. In other words, the pressure changes on the right side of the bellows are canceled by corresponding pressure changes on the left side of the bellows so that the nozzle is restored to its original position and the temperature is restored to the control point As the derivative restriction "T" is gradually closed, the pressure to the control valve must lead the pressure on the right side of the bellows by an amount depending upon the restriction. A study of the circuit will show that the magnitude of the lead is dependent upon the rate of change of the controlled variable, but the lead time is primarily a function of the restriction "T."

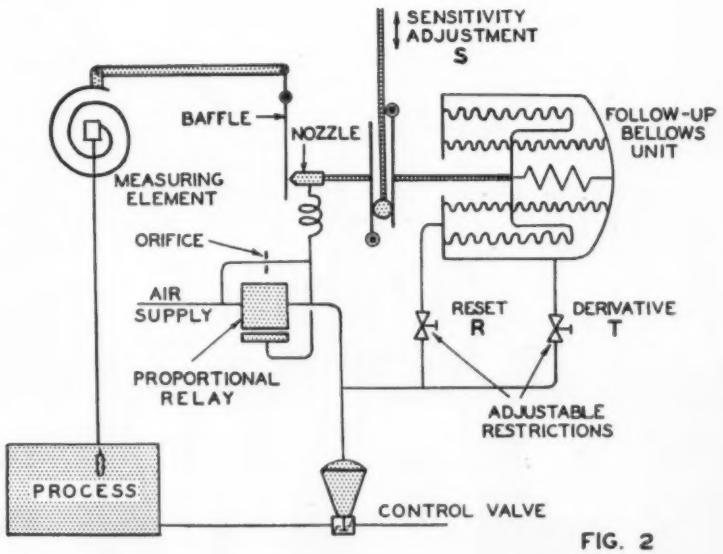

FIG. 2

*Portion of paper, "Tri-Act Control—a New Concept," by R. E. Clarridge, Taylor Instrument Cos., presented at fifth annual instrument symposium, Texas A. & M. College.

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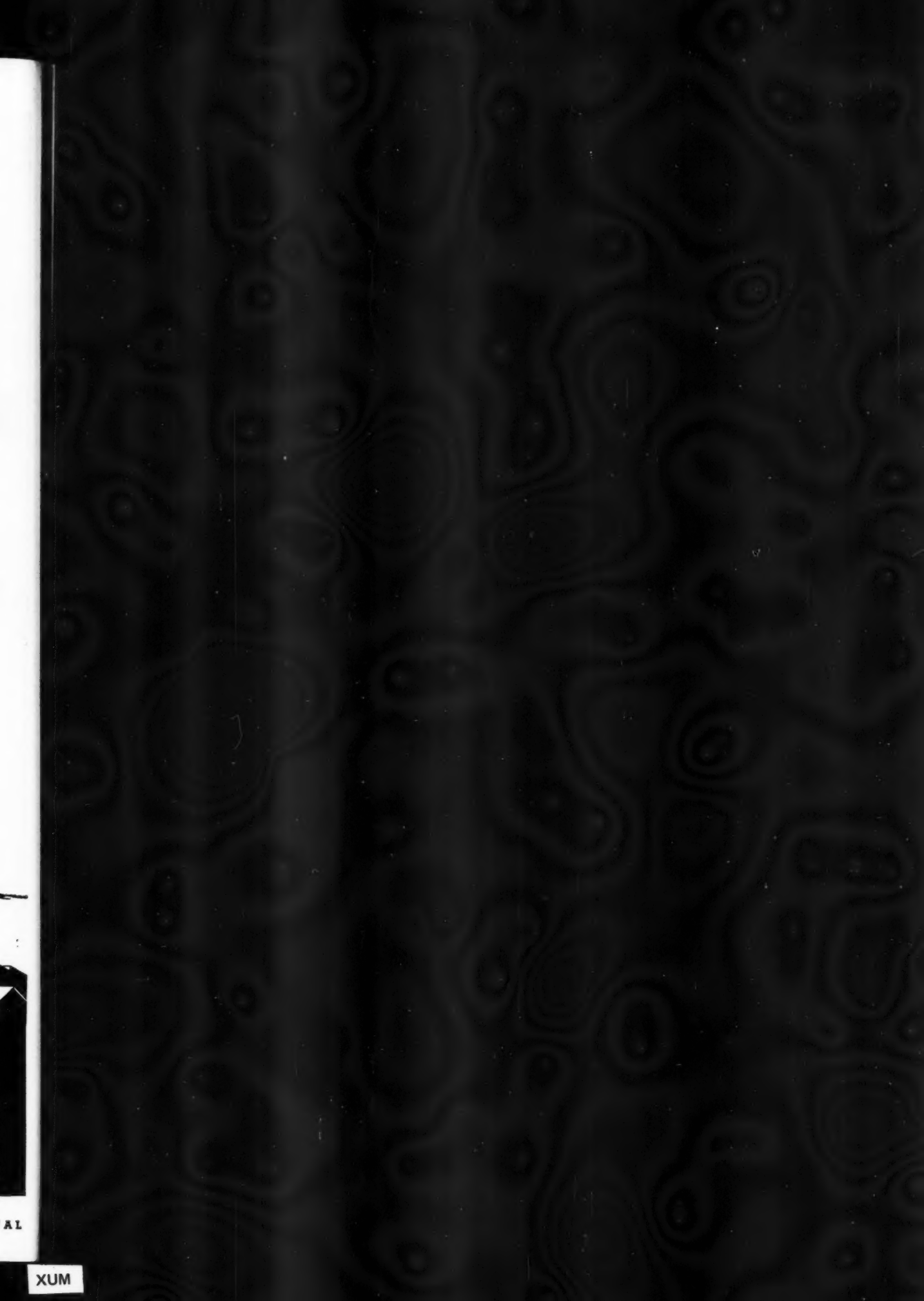

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Water-Oil Ratios

THERE are various ways of representing water production, two of the most common being water-cut and water-oil ratio. The first of these is defined as the per cent of water in the total produced liquids, and the latter is a rate of water production divided by a rate of oil production similar to the gas-oil ratio.

Just as there is a basis for gas-oil ratio in relative-permeability measurements, so there is a basis for water-oil ratio. Although one seldom sees a curve of k_w/k_o (relative permeability to water divided by relative permeability to oil) as a function of water saturation, these curves are in many respects similar to k_g/k_o curves. Fig. 1 is a set of oil-water relative-permeability determinations.[1] In Figs. 2 and 3 these same data are plotted as k_w/k_o versus oil saturation, first on a coordinate plot and then on semilogarithm paper.

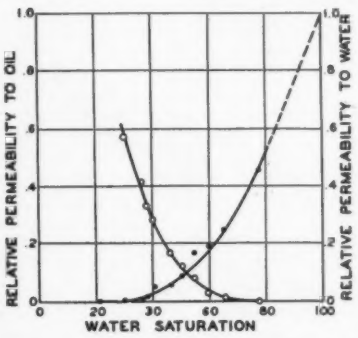

Fig. 1—Relative permeability oil water.

For water and oil flowing simultaneously through a reservoir, an expression for their ratio similar to that for gas and oil can be worked out. Let oil and water be flowing together through section and assume the pressure gradients in the two phases to be the same. The rate of reservoir oil flow, q_o, would be $(k_o/\mu_o)\,A\,(dp/dl)$, and the rate of reservoir water flow would be $q_w = (k_w/\mu_w)\,A\,(dp/dl)$. The oil flow measured at the surface will be the reservoir flow divided by the formation-volume factor, but the water flow measured at the surface will be substantially the same as the water flow in the reservoir. The surface ratio is, therefore:

$$W = Q_w/Q_o = q_w/(q_o/\beta)$$

$$= (k_w/k_o)\ (\mu_o/\mu_w)\,\beta$$

an expression similar to the gas-oil ratio.

In the place of k_w/k_o in Fig. 2 one could use the water-oil ratio provided the viscosities and formation volume factor were constant. In place of oil saturation one could use the negative of cumulative oil production, and as a first approximation find a curve similar to Fig. 2. One generally finds that water-oil ratio versus cumulative production is such a curve. Fig. 4 shows some typical water-oil ratio versus cumulative oil measurements made during the water flooding of a long core system.[2] A different rate of water-oil-ratio change was found with different viscosity ratios as would be indicated by the equation.

References

1. Harrington, J. D., M. S. Theisis, University of Oklahoma, 1949.
2. Everett, Gooch, and Calhoun, Liquid-Liquid Displacement in Porous Media as Affected by the Liquid-Liquid Viscosity Ratio and Liquid-Liquid Miscibility, Petroleum Technology, August 1950.

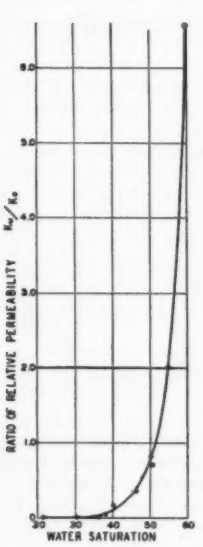

Fig. 2

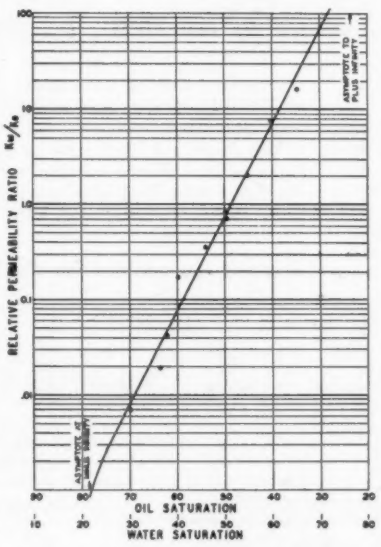

Fig. 3 (Data from Reference 1)

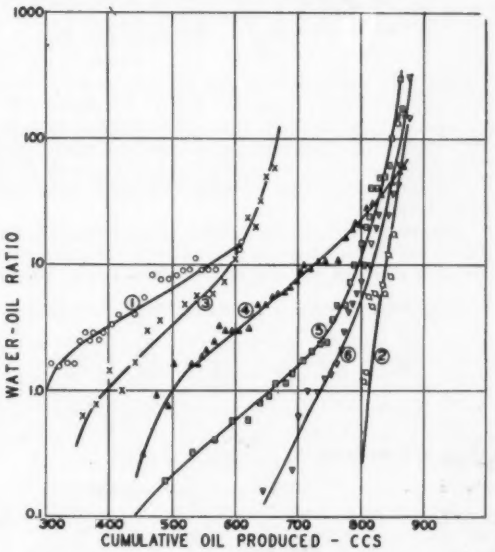

Fig. 4—Displacement history during secondary phase to show similarity to K_g/K_o curves. Numbers indicate run numbers with different values of μ_o/μ_w.

Series by Dr. John C. Calhoun, Jr., Chairman, Petroleum Engineering School, Penn State College

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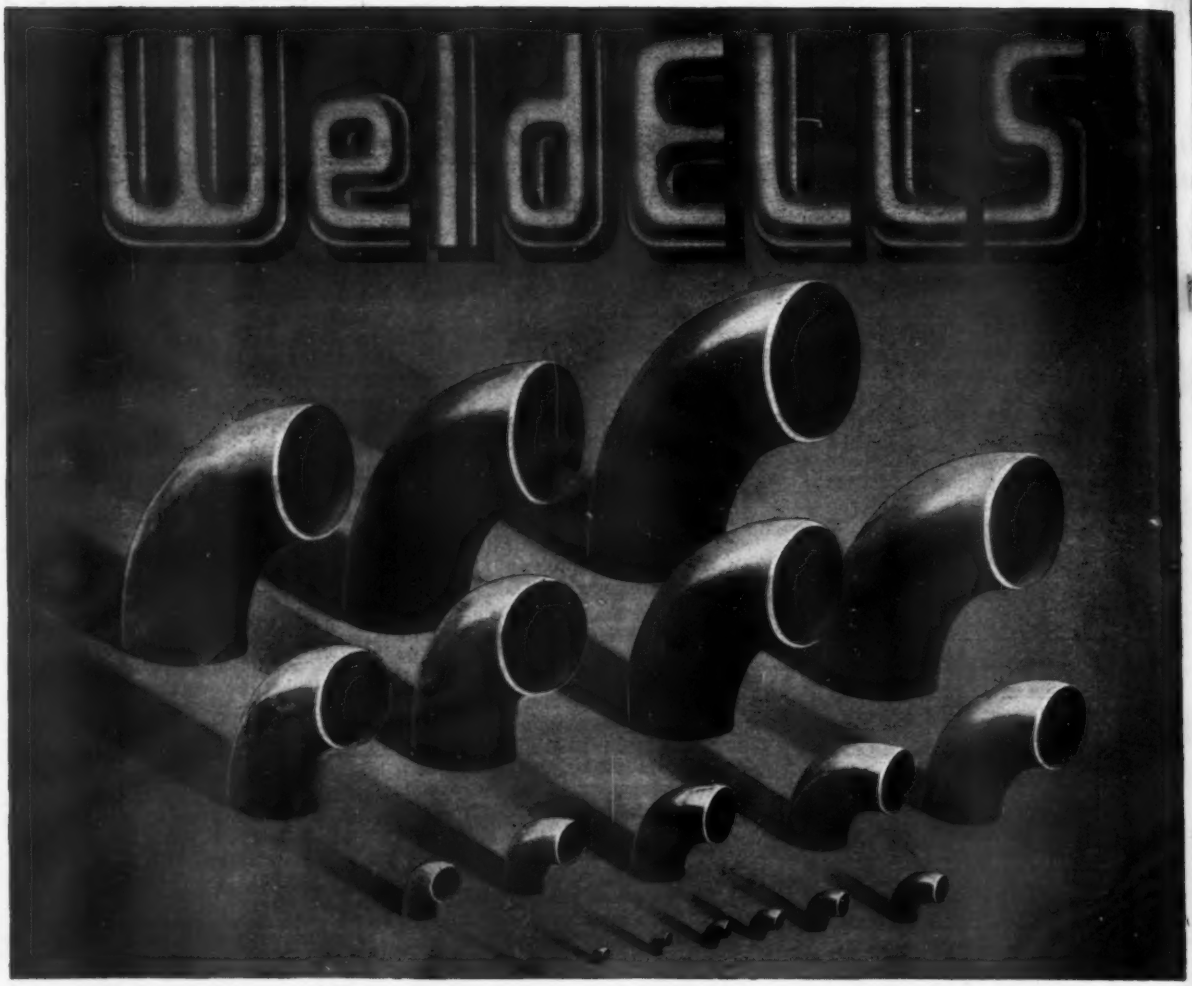

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4 MICROSEN TEMPERATURE INDICATORS AND RECORDERS. Introduces a new line designed to fill the need for a sturdy, yet economical, type of electrical instrument capable of measuring temperature between minus 100° F. and plus 3,000° F. *Manning, Maxwell & Moore, Inc.*

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6 METER ADAPTER FOR HORIZONTAL LINES. Catalog 25 describes an adapter now available for installing Flowrator meters in horizontal process piping, eliminating the necessity for a vertical rise in a line where head room is at a premium. *Fischer & Porter Co.*

7 RADIO IN PETROLEUM INDUSTRY. A new booklet, covering broadly the use of two-way radio in the petroleum industry, covers general uses being made of two-way equipment, types of systems, licensing regulations, equipment capabilities, special installations relaying, costs of installations and savings experienced by operators using two-way radio in their work. *General Electric.*

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11 **ANGLE-DRIFT-VERTICAL DEPTH INDICATOR** is a slide scale supplying information on angles ranging from 1° to 90° inclusive. One panel contains data on measured depth, drill angle, and total drift while another panel refers to true vertical depth and loss in depth. *Houston Oil Field Material Co., Inc.*

12 **SR-4 FLUID PRESSURE CELL.** Bulletin 306 contains engineers' drawings and a description of a highly accurate pressure-sensitive device in which variations of gas or liquid pressure produce corresponding variations in electrical output. *Baldwin Locomotive Works.*

13 **MODERN UNITIZED MOTOR CENTERS** is an eight-page illustrated brochure that explains low-voltage-motor control centers that provide the ultimate in appearance, installation and space economy, safety, operating efficiency, flexibility, and simplified maintenance. *Nelson Electric Manufacturing Co.*

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15 **HYDRILL GK BLOWOUT PREVENTERS AND HYDRO-PNEUMATIC ACCUMULATORS.** Bulletin L contains operating instructions and an illustrated parts list on both the GK blowout preventer and the hydro-pneumatic accumulator. *Hydril Co.*

16 **BETTER INSTRUMENTS FOR THE OIL INDUSTRY** presents the advantages of Barton recording and indicating flowmeters; Bristol recording pressure gages, gas-line thermometers, electrical and pneumatic controls; Buffalo Niagara oil and water meters; E.L.I. subsurface equipment, gages, and clocks; and Robinson orifice fittings. *Industrial Instrument Corp.*

17 **AUDCO LUBRICATED VALVES.** A multi-color, 173-page catalog covers cast iron valves, valves for corrosive services, steel valves, round opening valves, steam-jacketed valves, multiport valves, level gage fittings and protectors, high vacuum valves, and a section on wrenches, operating equipment and accessories; and lubrication, care, maintenance, and repair. *Audley Engineering Co., Ltd.*

18 **GUYTON ROUTING VALVE,** a multi-color brochure, introduces a poppet type valve which automatically controls the flow of oil from the well to the storage tanks. As each tank is filled the valve automatically closes and the flow of oil is routed to the next tank in the battery without manual attention. *Murdock Tank & Manufacturing Co.*

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20 **FLOSEAL PACKERS** is an extensive price list and selection table on every type and size of packing offered. It also includes information on how to order. *Lane-Wells Co.*

21 **LUMMUS AT CIT-CON** is a pictorial coverage of the new refinery at Lake Charles, La., the joint enterprise of Cities Service Oil Co. and *Continental Oil Co.*

22 **PACKINGS AND GASKETS MADE OF TEFLON.** In addition to listing a full line of packings and gaskets this two-color booklet describes the physical characteristics of Teflon which is extremely inert to chemicals, heat resistant, and is tough and durable. *Garlock Packing Co.*

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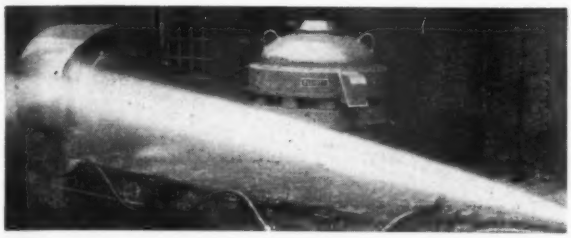

machine. Its ventilating air-inlet openings are located on the sides of the motor and discharge between the feet. Both provide a straight-through path for high-velocity wind and rain, thus bypassing the interior of the motor. The vertical motor is normally mounted on top of vertical pumps, well up from the ground; thus permitting air intake through bottom of motor and side discharge. Both inlet and discharge passages are baffled to permit wind-borne rain to blow through the outer chambers, bypassing the interior of the motor. *Elliott Co.*

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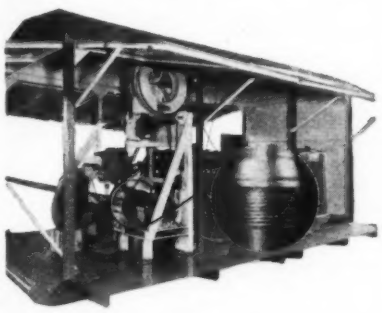

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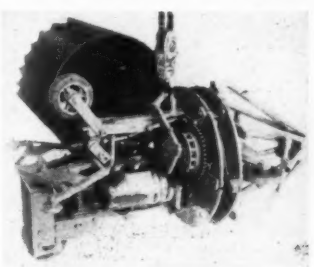

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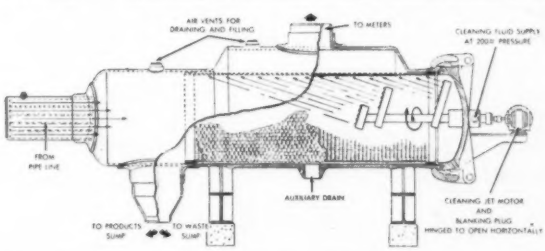
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Stainless screen, up to 400 mesh, is spot welded to basket. Automatic pressure differential gage governs strainer operation. Illustration shows how strainer element is cleaned by means of jets set in revolving hood which is an integrad part of strainer. Strainer is available in either horizontal (illustrated) or vertical types for any capacity or pressure necessary. *Thornhill-Craver Co., Inc.*

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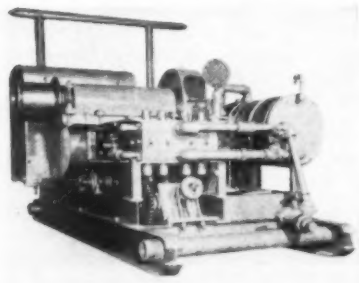
28 TEXAD replaces steel plate casings on industrial furnaces, improves air tightness, reduces enclosure costs, provides a completely weatherproof finish, and adds to the attractiveness of the finished job. Texad combines a plasticized synthetic-resin emulsion, used as an adhesive with strips of lightweight canvas. The covering seals the unavoidable shrinkage cracks in the finish coat of insulating cement and acts as a safeguard against air leakage caused by the insulation's own porosity. Savings are made because the canvas sheathing is much less expensive than steel plate—and easier to get; labor and erection costs are lower. The Texad finish is applied just like wall paper; there's no bolting or welding. Outdoor boilers are completely protected against rain, snow, and sleet. Those inside buildings are made completely waterproof and can be washed down when desired. Texad dries to a bright, white finish. *Bigelow-Liptak Corp.*

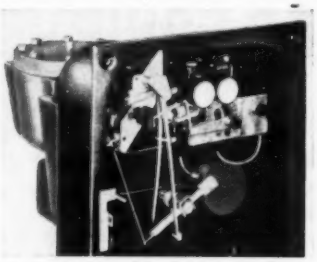
IT'S NEW CHECK IT

29 CASING-PULLING MACHINE, used in producing areas for the past 10 years, is capable of pulling a joint of pipe per minute. It is equipped with a four-cylinder pump with a 2½-in. shaft operating up to 600 r.p.m. and 6,500-lb. pressure. The crankshaft operates on Timken roller bearings, in complete oil bath, and is removable without dismantling the pump. Features of the pump include larger intake and exhaust valves and all controls are easily operated from the operator's seat which is protected from falling pipe by a sturdy headboard. This machine is equipped with a three-ball, full-opening release valve to facilitate operation of jacks. It can be mounted on tracks or skids and comes with or without the mast pole. *Riley Machine Works.*



IT'S NEW CHECK IT

30 NEW AUTOMATIC FLOW CONTROLLER provides lower maintenance with higher accuracy and fast response. Flow rate is measured by the Magna Clutch flow meter which utilizes a frictionless magnetic coupling between float and pen and control mechanism on the other. Highest accuracy is achieved by the large float and long float travel. Sensitive pneumatic controller is equipped with fully adjustable automatic reset and proportional band adjustable from 0-175 per cent. Lowest maintenance is achieved by eliminating the stuffing box or pressure-tight bearing and by use of O-ring manometer seals in place of gaskets. The manometer is fully accessible without disconnecting the pressure piping; there is only one moving part, the float, which can easily be removed. Both nozzle and restriction of controller have sapphire jewels to prevent wear, and restriction may be cleaned while in service. *Penn Industrial Instrument Corp.*



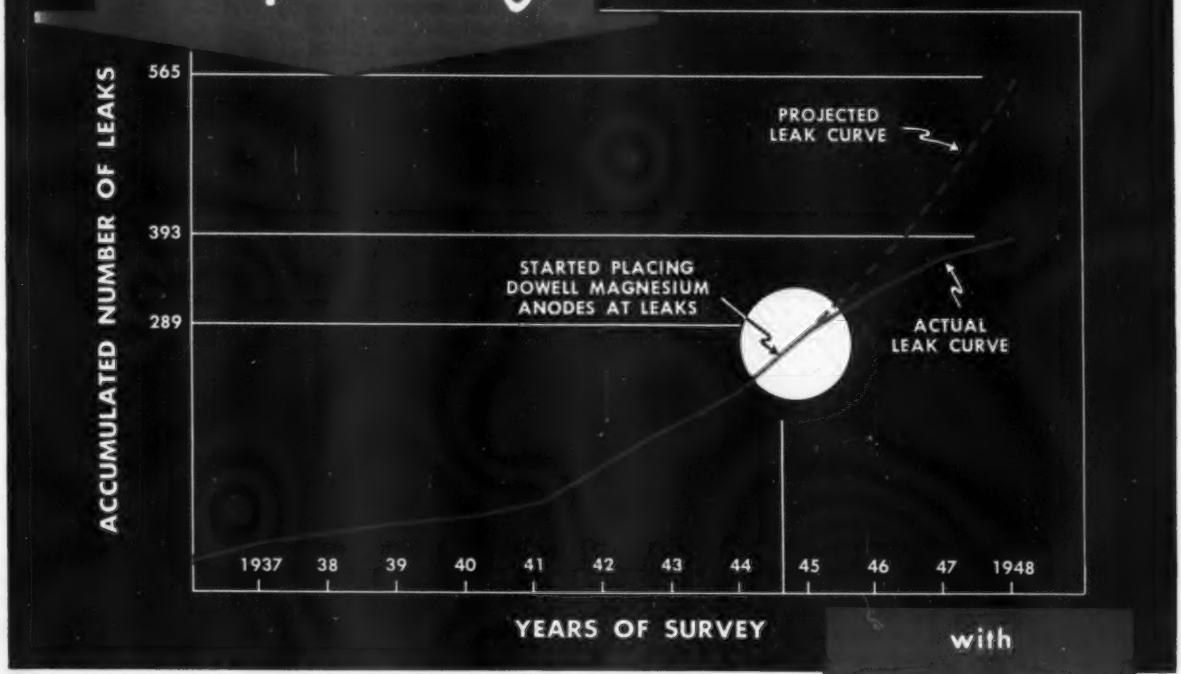
IT'S NEW CHECK IT

31 NEW TYPE FISHING BASKET. This tool for recovering cones and junk combines the lifting action of a high-velocity stream of drilling fluid with a pair of flexible pockets to pick junk off the bottom. Basket consists of a cylindrical tool with half of lower portion cut away to allow for passage of junk into the tool. A water course is formed in back portion forming a nozzle at the lower end. Flexible pockets form a receptacle for junk. As junk is forced off bottom by fluid, pockets collapse to allow junk to pass upward. Junk falls back into pocket as pocket snaps back to normal position. A second fluid passage directs a stream of fluid into the lower pocket keeping it clean until bottom is reached. A ball is then dropped in the pipe closing this passage. A fishtail blade at the end of the tool permits drilling out bridges and washing out cavings on bottom. When the hole is clean it can be determined by increase in pump pressure as weight is applied and by free rotation of the tool. *S. R. Knapp.*

IT'S NEW CHECK IT

32 A-800 HEAT EXCHANGERS have been developed for oil cooling in diesel engine, gasoline engine, and similar applications. They are standardized in manu-

hot spot economy!



with

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How a pipeline company cut anticipated leak rate 62%

172 future corrosion leaks prevented by installation of Dowell magnesium anodes! As shown in the graph above, that's the estimated number of new leaks prevented in a 3½ year period on a 12-inch bare Dresser-coupled line with 28 corrosive areas.

Such cathodic protection is economical as well as effective. This company installed anodes at each leak point when leaks were repaired. *The total cost of the anode installation was more than off-set by the maintenance savings* resulting from the reduction in the rate of new leaks.

Sizeable reductions in the number of new corrosion leaks are common when Dowell magnesium anodes are installed. The protection obtained in a particular soil is governed by the number of anodes used.

Dowell magnesium anodes require no external power or maintenance. In addition to oil and gas pipelines, they have proved valuable in controlling corrosion of municipal gas and water lines, storage tank bottoms, and many other underground and underwater installations. Write to Tulsa, Dept. 17, for free booklet and more information.

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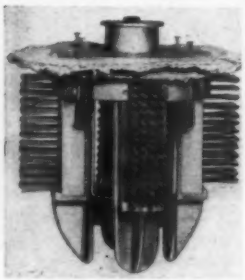
facture for prompt delivery and minimum cost. They are engineered to provide high cooling capacity within a light-weight, compact shell. Units are well suited for use with engine jacket water as the coolant, maintaining a balanced temperature between oil and water when required. Bonnets provide smooth inlet and outlet flow with a minimum impact on headers and are removable for ease in cleaning. Tubes are secured into the headers to prevent leakage from vibration and temperature changes. *Young Radiator Co.*

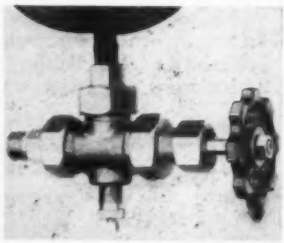
IT'S NEW CHECK IT

33 BRIDGING PLUG is made of drillable material and is used to form an off-bottom bridge on which cement, sand, etc., can be dumped. Canvas seal rings form a base on which the material to be dumped comes to rest when it is unloaded. Any tools used to drill out or break up cement will easily destroy the bridging plug. It is set in the casing by attaching the disk on top of the plug to the Cavins dump bottom, which is used as a setting tool, and lowered to the desired point. Raising the dump bottom releases the fingers which have secured the plug to the bottom. When the plug is thus released, notched dogs, which are hinged to swing outward, are also released and engage with the casing walls to secure the plug against downward movement when the setting tool or other tools are used to feel for bottom. Friction brushes prevent ordinary movement of the plug until the engaging dogs take hold. *Cavins Co.*



IT'S NEW CHECK IT

34 VALVES FOR INSTRUMENT PIPING reduce threaded connections from 10 to 3. These valves, which combine unions, nipples, reducers, elbows, tees, valve, and drain valve into one space-saving unit, are offered in nine styles which include valves with or without union outlet as well as offset and jacketed valves. One valve can be used to replace the multiple setup of valves and connections formerly used. Features, which are available on all or many of the nine valve styles, include: a safety shutoff; double-seating stem for repacking under pressure; choice of regular or quick-closing stem and lever; regrindable and renewable seats; pressure bleeder valve and test gage connection; outside screw and yoke when desired; and throttling stem when desired. *Jerguson Gage & Valve Co.*

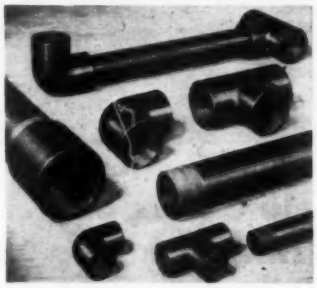


IT'S NEW CHECK IT

35 MECHANICAL DRIVES FOR METERS, CONTROLLERS, AND RECORDERS feature detachable escapements and space saving. Capsulized escapement mechanism can be detached for service or replacement. Over-all diameters are 3¼ and 3½ in. Both models require 1 31/32 in. between plane of driven chart and the mounting ring. Larger model has an 8-day wind and a basic 24-hour rotation. Turrets which snap on the main arbor are available to convert the 24-hour rotation. The smaller model has a 24-hour wind with a torque which drops from 8.6 to 4.7 in.-lb. between full-wind and 24-hour rundown. Thus there is enough extra capacity to carry over a reasonable period of neglect and still give 1.8 in-lb. of torque at 48-hour rundown. *Pittsburgh Equitable Meter Division of Rockwell Manufacturing Co.*

IT'S NEW CHECK IT

36 CARLON "TL," is furnished in 20-ft. lengths and incorporates standard International pipe threads. It can be threaded and cut in the conventional manner with standard pipe-fitting tools, and because of the inherent pliability of the plastic fit-up is more rapid. In addition, threaded leakproof joints are assured. Carlon threaded L-pipe features extreme light weight, exceptional ease of fitting and makeup, and complete immunity to rot, rust, and electrolytic corrosion. Furnished in standard pipe diameters from ¼ to 2 in., this new pipe is recommended for haudling fluids and gases of all types. Molded fittings are available with standard threads. *Carlon Products Corp.*



IT'S NEW CHECK IT

37 SWINGTITE FAST-ACTION BRONZE GLOBE VALVE has ball-and-socket design double disks which adjust readily to seat surfaces. Guide rims (A) on these disks rotate freely on the guide tracks (B) cast in the body, as the valve opens or closes. This roller action provides a self-cleaning and polishing effect, and also distributes the wear, since the seating position of the disks changes with each closing. With a liberal dimensioned body and cap, a hard, tough manganese bronze spindle, and a deep packing box, it will withstand rough usage and contain pressures far beyond those for which it is rated. The Swingtite is rated for 125-lb. steam service, 300-lb. cold oil, water, and gas, and is made in ½ to 2-in. sizes. *Jenkins Bros.*

IT'S NEW CHECK IT

NATURAL GAS

Gas Goes East

Transmission increased 34 per cent during 1949

John C. Casper

MOVEMENT of natural gas into the high energy-consuming area north of Tennessee-North Carolina and east of the Mississippi River was more than twice as great in 1949 as in 1947 and almost four times as great as in 1944, according to data from the 1949 gas report by the Bureau of Mines.

Postwar construction of long-distance lines has been the major factor in the gains in marketed production of natural gas, since they connect the large gas reserves of the Mid-Continent and Southwest with consumers in the densely populated and highly industrialized areas in north-central and northeastern states. The bureau reports that natural gas moving into these areas averaged 2,122,000,000 cu. ft. daily in 1949. Averages for other years since 1945 are shown in the accompanying table.

The importance of this movement in the over-all development of natural-gas markets is indicated by selected comparisons with operations in 1948. Total marketed production of natural gas in 1949 increased 5.3 per cent over 1948. Total interstate movement increased 14.6 per cent. Movement into the above high-demand areas increased 34.2 per cent. For further comparison, the increase in movement into the high-demand area represented 77.2 per cent of the total gain in interstate shipments and 69.1 per cent of the total increase in marketed production.

Price paradox.—The average value at the well of all gas marketed in 1949 was 6.3 cents per thousand cubic feet, down .2 cent per thousand from 1948. On the other hand, the average value at point of consumption was up 1.3 cents per thousand cubic feet to 25.4 cents.

The reduction in average well-head price resulted from three factors: Decreased production in the high-value north-central and Appalachian areas; big gains by states with low well-head values; and some price reductions in the high-demand areas, brought about by the increase in supply from the Southwest. Every state with an average well-head price above the national average had a decrease in marketed production in 1949. Texas, with an average well price of 4.6 cents in 1949 and 4.5 cents in 1948, had a larger increase in marketed production than the country as a whole. Production outside Texas decreased for the year.

Completions of major new-line and looping projects in late 1949 and 1950 insure additional gains in the movement of natural gas from southwestern states to areas in the north and east. As in the years 1948 and 1949, this increased movement will account for a large part of the total gain in marketed production.

MOVEMENT OF NATURAL GAS INTO AREA NORTH OF TENNESSEE-NORTH CAROLINA AND EAST OF MISSISSIPPI RIVER

(Thousands of cubic feet per day)

	Average for year	Increase over previous year
1945	755,500	157,700
1946	846,500	91,000
1947	1,026,700	180,200
1948	1,580,700	554,000
1949	2,122,000	541,300

Export Scaled Down

WASHINGTON. — Panhandle Eastern Pipe Line Co., Kansas City, has scaled down by one-third its proposed volume of natural gas which it asked authority of the Federal Power Commission to export to Union Gas Co. of Canada, Ltd.

The amended proposal, on which hearings will be held December 5, asks authority to export approximately 18,250,000,000 cu. ft. of natural gas yearly, compared with the volume originally set at 27,350,000,000 cu. ft.

Panhandle would deliver the natural gas through an existing pipeline crossing under the Detroit River at the International boundary near Detroit. Construction of these facilities was authorized 4 years ago when Panhandle then proposed to export 5,500,000,000 cu. ft. of natural gas yearly.

Storage Development Set

WASHINGTON.—United Fuel Gas Co., Charleston, W. Va., has been authorized by the Federal Power Commission to construct and operate approximately 5.5 miles of pipe line and other facilities in connection with its underground-storage expansion in West Virginia. Cost of the development is estimated at $2,621,061.

United Fuel will build about 3.5 miles of pipe line from its Kanawha compressor station near Nitro, W. Va., to an existing line serving the company's storage pool X-15. A 2-mile pipe line will connect with Tennessee Gas Transmission Co.'s system near Hunt, W. Va., and extend northerly to United's Hunt compressor station.

An 880-hp. compressor station will be built in storage pool X-54, north of Hunt, and a 300-hp. compressor station to be built in storage pool X-8 will be used to inject and withdraw additional volumes of gas into and from storage pools X-7 and X-8. A 5,280-hp. station will be located in storage pool X-52 near Coco, W. Va.

Rate Rise Suspended

WASHINGTON.—The Federal Power Commission has suspended the proposed $5,200,000 rate increase sought by Northern Natural Gas Co., supplying natural gas to 28 utilities with 728,000 customers in Iowa, Minnesota, Kansas, Nebraska, and South Dakota.

Further hearings have been set for February 19. Northern had asked that the rate boost be declared effective November 27. Advance in operating costs was declared by Northern to make the increase necessary.

Indiana Lines Sold

WASHINGTON. — Greenfield Gas Co., Greenfield, Ind., has received temporary authority from the Federal Power Commission to acquire distribution facilities of Indiana Gas & Water Co., Indianapolis. The lines will serve natural gas to markets in Fortville, Ingalls, McCordville, and Mohawk, Ind.

Natural Gasoline

Royalty Formula Announced

WASHINGTON. — A new formula for the payment of natural-gas gasoline royalties from production from Federal lands in California was announced last week by the Navy and Interior Departments.

Effective November 1, it was ordered, for the purpose of computing royalty the price for natural-gas gasoline in the field where produced "shall be the highest price per gallon posted and paid for natural-gas gasoline of like Reid Vapor Pressure in the field, or if there are no postings in the field where produced, the highest price posted in the nearest field where a comparable grade of natural-gas gasoline is produced and sold."

It is further provided, however, that in case a greater price is received for natural-gas gasoline, or a greater value is determined by the Secretary of the Interior as to federal lands outside of naval petroleum reserves or by the Secretary of the Navy as to lands within naval reserves, such greater price or value shall be used in computing royalties.

The new order constitutes the first change in the formula since 1931.

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PIPE LINES

Gas From Transco

New York City to get fuel regularly on December 12

Dahl M. Duff

NEW YORK.—First natural gas from the Transcontinental Gas Pipe Line Co. system is scheduled to begin moving into New York City December 12 on a regular basis.

Some gas is expected to be feeding through the line for testing and shakedown of the system by December 1. Capacity of the line will be built up gradually with 400,000,000 cu. ft. daily scheduled to be reached by the first of the year and the full authorized 505,000,000 cu. ft. daily by next March.

Commencement of operations in this world's longest natural-gas line will be marked at a gathering of company guests scheduled for December 12 at New York's Waldorf-Astoria Hotel. The 1,840-mile, mostly 30-in. line, now completed to take gas from the upper Gulf Coast, when entirely finished next spring will extend to Mercedes, Tex., in the Rio Grande Valley.

One of the final phases of the project, laying the Hudson River crossing opposite 134th Street in New York City, was completed early this month *(The Oil and Gas Journal, November 9, page 52)*. The metering pier at the end of the Transcontinental line in Manhattan is now finished. At this point, New York City distributing utilities pick up the gas for movement to their plants where it will be used to enrich manufactured gas.

More construction.—Even with completion of its main line from Texas, considerable further construction is in prospect by Transcontinental in the New York City metropolitan area. A hearing is scheduled to be held by the Federal Power Commission November 27 on the company's plan for an auxiliary line leading into New York across the Narrows in New York Bay.

If approved, the project will involve another major underwater crossing by the system. This $3,585,000 line would extend from near East Carteret, N. J., to the Bay Ridge section of Brooklyn. The 11.2-mile extension of 20 to 26-in. pipe would minimize the possibility of interruption of service due to the present single line across the Hudson.

River crossing.—Transcontinental also is planning still another crossing of the Hudson near Hastings, N. Y. This crossing with a line extending on across Westchester County, New York, to the Greenwich, Conn., area will provide the link by which Transcontinental will meet part of the requirements of the Northeastern Gas Transmission Co. in New England.

Northeastern on November 8 was authorized to begin serving a part of the New England market. The company is a subsidiary of Tennessee Gas Transmission Co. and is to take gas from T.G.T. near Pittsfield, Mass., as well as from Transcontinental.

Transcontinental's authorized capacity includes some 64,000,000 cu. ft. daily for delivery to the system which

TEXAS ILLINOIS PROJECT.—One of the problems encountered by construction crews on Texas Illinois Natural Gas Pipeline Co.'s project has been the multitude of oil and gas lines already in place that must be crossed. Here a long section of the 24-in. line to Old Ocean field is put into place beneath a cross-line. (H. C. Price Co. Photo.)

Swampland construction for 20" line in North Louisiana . . by LATEX in 1949.
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Northeastern will build. The FPC decision provides that Northeastern will take an additional 156,000,000 cu. ft. daily from the enlarged T.G.T. system.

Shell Builds Pump Unit

ELK CITY, Okla.—Shell Pipe Line Corp. has begun construction of a pump station here, scheduled for completion in February. The installation will be housed in a masonry building, and will include a 500 hp. centrifugal pump driven by an electric motor. Pumping capacity will be approximately 25,000 bbl. daily, with provision for an additional unit to be set later.

The station is located adjacent to Shell Oil's new natural-gasoline plant, and will pump crude oil and distillate over the 160-mile, 10-in. pipe line to Cushing, Okla. Present service on the pipe line is from two field pumps. At Cushing the crude enters the Ozark Pipe Line System for delivery into Shell's Wood River, Ill., refinery. Refinery Maintenance Co., Compton, Calif., has building contract.

Gas-Line Route Surveyed

Humble Oil & Refining Co. has started surveying right-of-way and obtaining crossing rights for the construction of a 50-mile, 8-in. gas pipe line from the Trawick gas field of Nacogdoches County, East Texas, to the Tennessee Eastman Corp. plant in Harrison County.

Humble is sole operator in the Trawick field, with six gas wells capable of producing from 35,000,000 to 45,000,000 cu. ft. of gas daily, per well.

Trojan Construction Co., Oklahoma City, has contract for the line. According to reports, pipe for the project has been secured and a field office has been set up at Henderson to supervise the project. Humble will also build a complete gathering system in the field.

Purchase Right Asked

WASHINGTON.—Pipe-line facilities serving natural-gas markets in Fortville, Ingalls, McCordsville, and Mohawk, Ind., are the subject of an application filed with the Federal Power Commission in which Greenfield Gas Co., Greenfield, Ind., proposes to acquire them from Indiana Gas & Water Co., Inc.

Greenfield asked that the commission either disclaim jurisdiction, or authorize the company to proceed with the purchase and operation. Value of the properties is placed at $45,000.

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R. H. FULTON started in business on January 1, 1940, and from the beginning has operated under the trade name of R. H. Fulton & Co., maintaining headquarters offices at Lubbock, Tex. His early undertakings were small jobs in the fields of West Texas and New Mexico, but in 1944 he expanded operations to main-line construction projects.

Current operations. — During 1950 the Fulton organization completed 204 miles of 30-in. and six river crossings for Transcontinental Gas Pipe Line Corp. in North Carolina, South Carolina, and Virginia.

R. H. FULTON

For Northern Natural Gas Co., Fulton has completed this year approximately 500 miles of 20, 24, and 26-in. in Texas, Oklahoma, and Kansas. The Northern Natural program also included five river crossings in Kansas.

At present Fulton is carrying on extensive operations for Trunkline Gas Co. which include the following: 184 miles of 26-in. in Tennessee to be completed in 1951; 278 miles of 20-in. in Texas; and two river-crossing jobs.

Altogether these 1950-51 projects total 1,166 miles plus 13 river crossings.

Personnel.—R. H. Fulton is owner and manager of the firm, and Clark Williams is general superintendent. Job superintendents are Ed Veach, M. L. Boyd, A. A. Carrigan, and Jerry Nash. River-crossing foremen are Banjo Veach and Pat Patterson. K. O. Patterson is manager of the Lubbock office.

Equipment. — The firm has shops and warehouses at Lubbock, Tex., and Dodge City, Kans., for maintaining equipment in good repair at all times to meet construction schedules consistently. Fulton aims at taking only the volume of work which can be completed in contract time. Equipment available for 1951 operations is sufficient for five spreads and two large river crews. For river work, the Fulton organization owns dewatering and dredging equipment.

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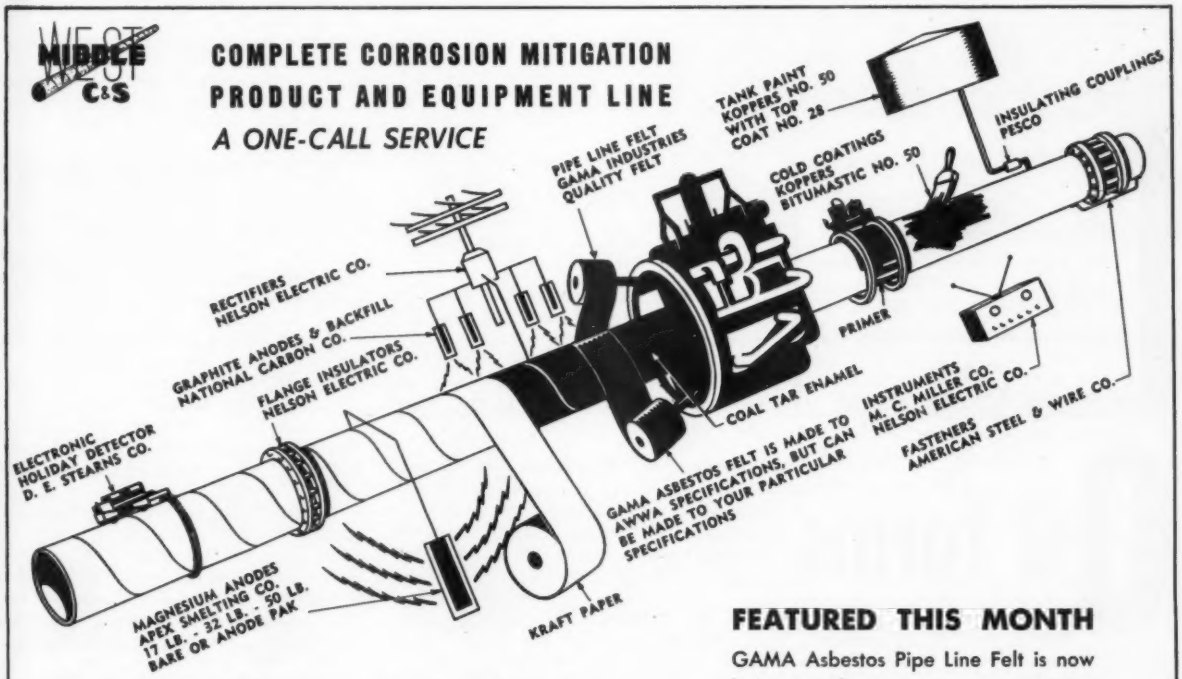
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Among the Drilling Contractors

Number of Active Rigs Sets New Record "High"

Operating rotary rigs in the United States and western Canada during the week ended November 13 totaled 2,499, a new all-time record high. The number was three more than the previous record, set during the week ended October 23. It was an increase of four over the previous week. The total for the United States alone was 2,391, also a new record, and an increase of 6 over the previous record of October 23. Most notable increase in activity was in the Gulf Coast area with 17 additional rigs reported running. Slight slackening of work was reported in the Arkansas-North Louisiana-East Texas, Illinois-Eastern, Pacific Coast, and western Canada areas.

ROTARY RIGS IN OPERATION*
(United States and Western Canada)

Area—	Week ended 11-13-50	Change week ended 11-6-50	Change week ended 11-14-49
Gulf Coast	583	+17	+ 67
W. Tex.-N. M.	800	+ 3	+141
Ark.-N. La.-E. Tex.	159	— 1	— 9
Oklahoma	283	+ 3	+ 36
Kansas-Nebraska	158	+ 4	+ 33
Illinois-Eastern	141	— 7	+ 1
Rocky Mountains	133	+ 3	+ 22
Pacific Coast	134	— 6	— 33
Total U. S.	2,391	+16	+258
Western Canada	108	—11	+ 25
Total	2,499	+ 5	+283

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States as a whole and in the Rocky Mountains and Western Canada areas are shown by charts on pages 134 and 135.

Dillard & Waltermire, Houston, are starting a semiwildcat test for The Texas Co. at 1 Scarborough, in the E. L. Stickney Survey, 1½ miles southeast of Sandusky, Grayson County, North Texas. Rotary tools are being used.

Roeser & Pendleton, Inc., Fort Worth, has a rig running for Sinclair Oil & Gas Co. and Sohio Petroleum Co. in the Esperance field, Concordia Parish, eastern Louisiana. Current operation is 3 Campbell, a 7,500-ft. test.

C. B. Drilling Co., Abilene, Tex., has the contract for the Caddo limestone wildcat test which C. L. Norsworthy, Jr., will drill in the John Fairchild Survey, 3 miles west of Ballinger, Runnels County, West Texas. The test is 1 Curtis.

Mohawk Drilling Co., Oklahoma City, is starting a 6,450-ft. Wilcox sand test in the area 11 miles east of Noble, Cleveland County, Oklahoma. The test, 1 Sprow, NW NW NE 28-8n-1e, is being drilled under contract with Miami Operating Co. of Grayville, Ill. Location is about 1½ miles southwest of the discovery well, recently completed, of the Roulette Creek pool.

Southeastern Drilling Co., Dallas, is moving a heavy rotary rig into the area 5 miles southeast of Brownfield, in Terry County, Texas, where it has a contract for a 11,000-ft. test to be drilled for Greenbrier Oil Co. and Mendota Oil Co. The test will be 1 Johnson with location in Section 46-T, D&W Survey. It is 2½ miles east of the Cotton field discovery well.

Mitchell-Gage Drilling Corp., Oklahoma City, is rigging up for a 5,500-ft. test to be drilled for its own account in the Northeast Navina pool, Logan County, Oklahoma. The test, 1 Weber, NE NE NW 29-16n-3w, is a south offset to the discovery, and so far only well in the pool.

Mabee Drilling Co., Midland, Tex., is drilling a projected 4,000-ft. wildcat test for Southern Minerals Corp. at 1 Deakins, Section 115, ETRR Survey, 1 mile west of Talpa, Runnels County, West Texas. Location is 2 miles south of the Burt field.

A. D. Allison & Co., Wichita, is drilling for Albert Markham at 1 Heitschmidt, SW SW SW 11-9-14, a rank wildcat located 2 miles west of Covert, Osborne County, Kansas. Nearest production is in the Laton pool, 11 miles to the west.

Frank Wood & Associated, Inc., Odessa, Tex., has the contract for a 6,100-ft. Ellenburger test to be drilled for Texas Pacific Coal & Oil Co. at 1-A Robertson, Section 185, BBB&C Survey, 3 miles northeast of Hamlin, Fisher County, West Texas.

R. P. Phillips Well Service Co., Lafayette, La., has the contract for Stanolind Oil & Gas Co. 2 Grief Brothers, latest test to be started in the Bayou Blue field, Iberville Parish, Coastal Louisiana. Projected depth is 7,000 ft. Location is in 75-9s-10e.

Carl B. King Drilling Co., Midland, Tex., will do the drilling for Ryan, Hays & Burk at 1 Hulme, a wildcat test in Section 8-D12, C&M Survey, 4½ miles northwest of Brownfield, in central Terry County, Texas. Contract depth is 10,000 ft.

THE NEW CAMERON

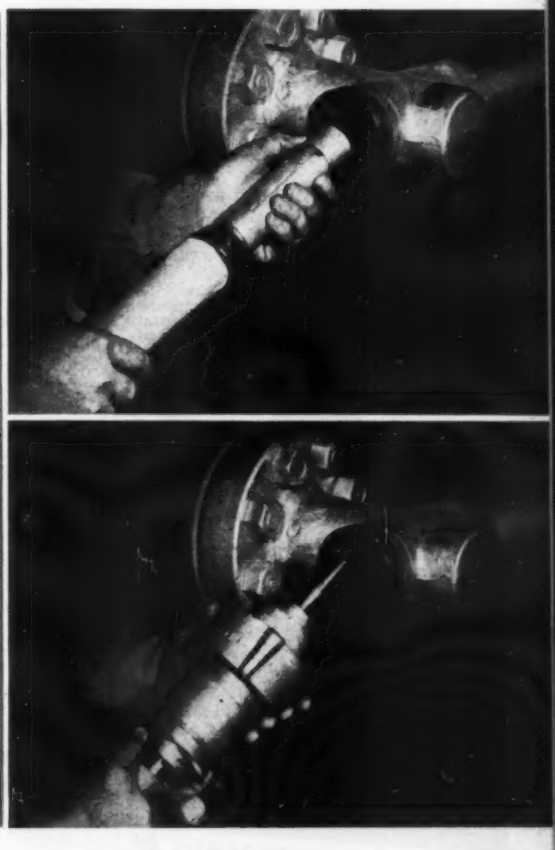
TYPE "H"

3 in 1 Choke

SIMPLIFIES BEAN CHANGING AND CONVERSION TO POSITIVE OR ADJUSTABLE

1 To change flow beans, simply tap the bonnet nut to loosen the connection. Trapped pressure is automatically relieved and the nut spins off.

2 Unscrew the bean retainer, which carries the bean in a sleeve, the sleeve being a part of the retainer.



3 The plain positive choke may be converted to a combination positive and adjustable by substituting a needle and bonnet assembly for the blanking plug. Or, a plain adjustable choke may be had by removing the cage nipple and substituting a seat for the positive bean retainer.

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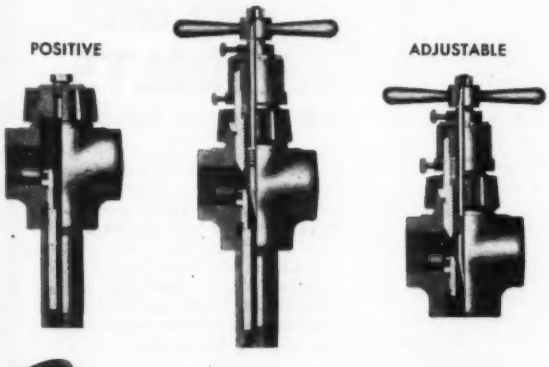
POSITIVE



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Crow Drilling Co., Inc., Shreveport, is drilling for Crown Central Petroleum Corp. at 1 Ardis, NE SE NW 13-15n-1w, a 3,000-ft. wildcat test 4 miles east of Atkins, Bossier Parish, North Louisiana.

Ace Drilling Co., Wichita Falls, Tex., has a rig running for T. D. Humphrey in the new productive area 4 miles east of Kemp, Kaufman County, Texas. Current operation is at 4 N. E. Tharp, a 6,200-ft. Rodessa test.

Fred B. Wimberly, Tyler, Tex., is making hole on a 5,000-ft. wildcat test being drilled for E. A. Eddison in the area 2½ miles south of Kemp, in southeast Kaufman County. The test is on the E. O. Williamson lease.

Prince Drilling Co., Houston, is starting a 10,000-ft. test for Gulf Refining Co. at 2 Mermentau, 13-14s-6w, in the Little Chenier field, Cameron Parish, Louisiana Gulf Coast.

Allen & Morris, San Antonio, have contracted with Southern Minerals Corp., Corpus Christi, for a 7,500-ft. wildcat test to be drilled in the W. M. Gamble Survey, 1½ miles northwest of Driscoll, Nueces County, Texas Gulf Coast. Name of the test is 1 Driscoll Estate.

Milton Crowe, Inc., Shreveport, has moved a rig into a location 3 miles southwest of Farmersville, Union Parish, Louisiana, where it will drill a deep wildcat test for Carter Oil Co. Location is for 1 Stancill, C NE SE 11-20n-1w. Contract is for 8,500 ft.

Hunter Brothers Drilling Co., Wichita Falls, Tex., has the contract for a semiwildcat test to be drilled for W. T. Graham of Amarillo, Tex., in the area 5 miles south of Makins, Archer County, North Texas. Rotary hole is projected to 4,200 ft.

C. B. Slemp has a rig running for Anco Gas Corp. in the Bolivar field, 4 miles northwest of Bolivar, Denton County, Texas. Current operation is at 1 W. E. Forester.

Drillers, Inc., Dallas, is starting a 6,500-ft. Ellenburger test for DeSoto Oil Co. in the area 3 miles south of Aspermont, Stonewall County, West Texas. Location of the test, 1 Guest, is in Section 91, Block D, H&TC Survey.

Mac Drilling Co., Houston, is moving in to drill Shell Oil Co. 1 Helen Gohlke, a projected 8,500-ft. Wilcox test located about ¼ mile east-northeast of the discovery well, 1 F. W. Gohlke Heirs, of the new field recently opened by Shell in DeWitt County, South Texas. Location for the new test is in the H. C. Kitchen Survey.

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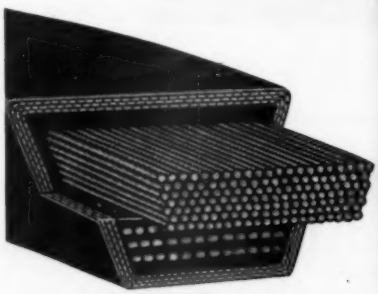

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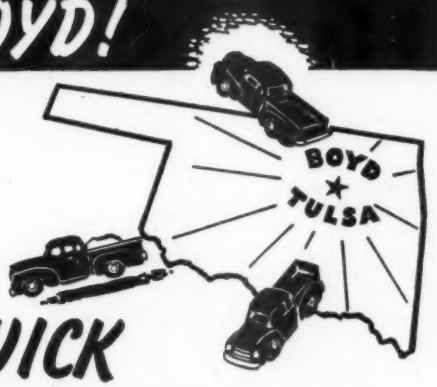

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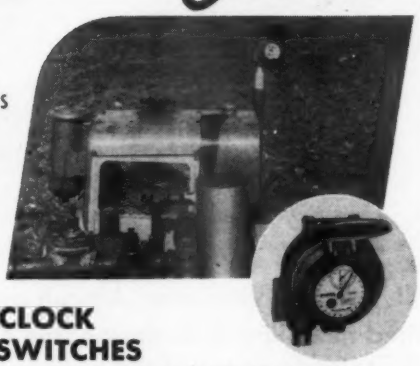

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REFINING

Aromatics Prices Up

Spot prices on aromatic solvents including toluene and xylene were upped 3 cents to 33 cents per gallon last week in New York. The quotation on tank-car shipments was made by a major oil refiner, and other manufacturers of petroleum-derived toluene and xylene were reported anticipating similar price rises shortly. Coke-oven prices for coal-derived aromatics remained unchanged at 25 cents per gallon for toluene and 26 to 29 cents per gallon for xylene, f.o.b. Pittsburgh.

The price rise attends a sharply increased demand for the two chemicals already in short supply. Little increase is expected in the production of coke-oven products, and it appears to be up to petroleum refiners to meet the growing demand. Estimated 1950 production of toluene is 28,000,000 gal. from coke ovens and 42,000,000 gal. from petroleum and tar distillation. Xylene production this year is expected to reach 8,000,000 gal. from coke ovens and 52,000,000 gal. from petroleum and tar distillation. The current price rise follows a 2-cent increase made last June.

Refinery Contract Let

E. B. Badger & Sons, Boston, has been given the contract to design and construct processing equipment which will double the capacity of Continental Oil Co.'s refinery at Lake Charles, La.

The expansion program, costing $10,000,000, will increase the refinery crude-oil capacity to 25,000 bbl. daily. The added facilities will include a Thermofor catalytic cracking unit and auxiliary equipment for producing high-octane gasoline.

Award of the contract was announced by L. F. McCollum, president of Continental. Construction program will be directed by Harold G. Osborn, company vice president in charge of manufacturing. Completion is scheduled for early 1952.

Sinclair Rubber Plant

Sinclair Rubber, Inc., has commenced production of petroleum butadiene at Houston. The Sinclair Refining Co. subsidiary is the first to reactivate a standby plant under the extended rubber program of the Office of Rubber Reserve, Reconstruction Finance Corp. The plant, at the company's 85,000 bbl. per day refinery, was in production 15 days after the introduction of feed stock.

Sinclair's facilities rank as the second largest of the petroleum butadiene plants in this country. Except for the power unit, it has been maintained in standby condition since late 1947. When ORR requested its reactivation in July, renovation was begun on all parts of the plant, including fractionation columns, pumps, turbines, motors, valves, piping and tanks.

Proven capacity of the revived plant is for 75,000 tons yearly, to be delivered to the nearby copolymer plant operated by Goodyear Synthetic Rubber Corp.

Taxes From Oil Show Gain

WASHINGTON.—Treasury revenue from the three special oil taxes for the first 9 months of this year ran $31,366,000 above the same period last year, all but $830,000 of it the result of increased gasoline consumption, the Internal Revenue Bureau reported last week.

Gasoline-tax collections for the first three quarters of the year were $405,384,731 against $364,790,764 in 1949 and revenue from pipe-line transportation was $15,002,792 against $14,167,880. Lubricating-oil receipts were practically unchanged at $62,018,332 against $62,081,419.

September collections, representing August business, included $55,158,300 from gasoline against $46,081,714 for the same month last year; $6,869,328 from lubricating oil against $5,361,639, and $1,672,110 from pipe-line transportation against $1,815,090, the bureau announced.

Plant Protection Plans

WASHINGTON. — Civil defense plans of the National Security Resources Board call for the protection of industrial plants and refineries against enemy attack on a state and local basis, but on the whole it will be up to plant management to guard against sabotage, espionage, and other subversive activities.

The NSRB is issuing manuals for plant protection and, in the case of plants designated as vital to the war effort, protective measures will be taken by the Government. Just what plants would be subject to FBI and military protection has not been disclosed, but they will be limited to the top category of essential facilities and the average refiner will be on his own.

Maps showing the critical target areas in their states subject to pos-

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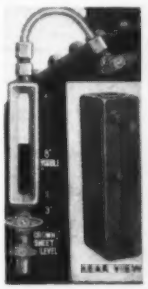

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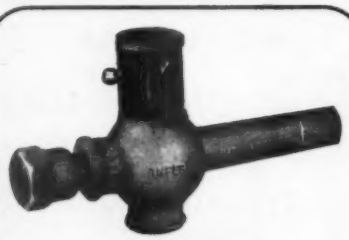

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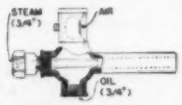

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sible air attack have been sent to all governors by the NSRB, together with outlines of how those areas should be grouped for mutual aid and mobile support in event of attack. These maps are classified restricted and are intended for use only by state and city authorities.

The state authorities also have been advised that they must impress on their industries the necessity for plant protection programs, and the close integration of each plant's measures with the civil defense program of the community in which it is located.

Isotopes Symposium

A symposium on theory and pracuce in the industrial application of radioisotopes, will be held at Hotel Statler, New York City, January 19, under the sponsorship of the American Chemical Society. Of particular interest to refiners is a paper entitled, "The Use of Radioisotopes in the Petroleum Industry," by Dr. Paul H. Emmett, Senior Fellow, Mellon Institute of Industrial Research, University of Pittsburgh. The principals of technology and general industrial application will be discussed in other papers. Carbon 14, an isotope widely used in petroleum chemical research, will de discussed in its relation to new frontiers in organic chemistry.

Dr. Paul C. Aebersold, chief of the Isotopes Division, U. S. Atomic Energy Commission, Oak Ridge, will be chairman of the symposium. The program for the afternoon and evening sessions was organized by John Kotrady, of The Texas Co., New York, chairman of the A.C.S. symposium committee.

Atlantic to Expand

PHILADELPHIA. — Immediate expansion of facilities for manufacturing synthetic detergents has been announced by the Atlantic Refining Co. A construction project costing between $3,000,000 and $4,000,000 will include the building of a new petrochemical plant at the company's Atreco refinery near Port Arthur, Tex., and the enlargement of the existing Philadelphia plant.

The new project will increase the volume of alkyl aryl sulfonate-type synthetic detergents now being manufactured at Philadelphia, and also add new products to the detergent line manufactured by the company's Chemical Products Section.

Atlantic was the first oil company to go into the manufacture and marketing of petroleum sulfonates, under the trade name "Ultrawet." Currently one of the largest manufacturers of this type of detergent, Atlantic's expansion will establish it as a leader in that field.

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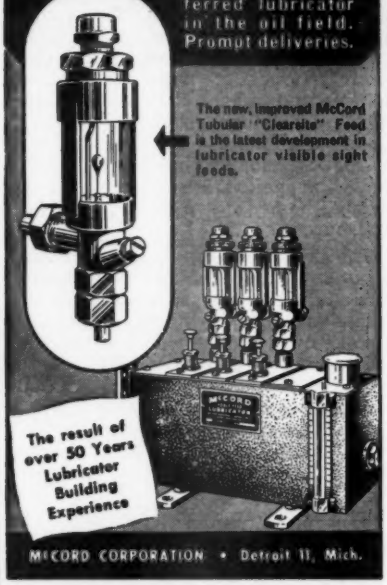
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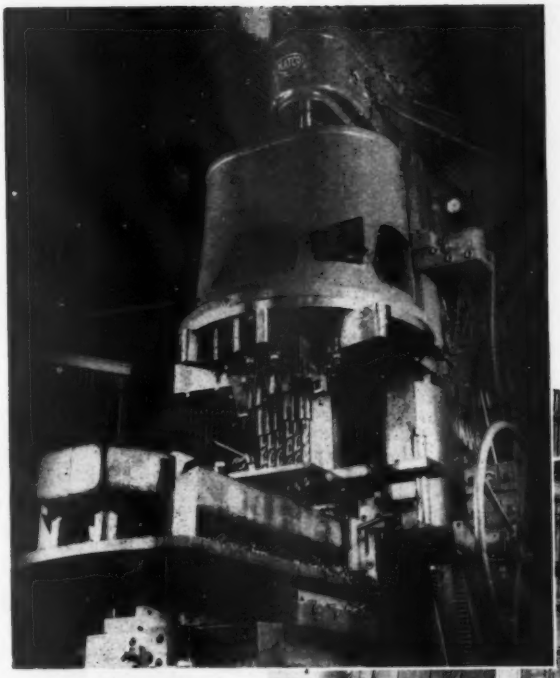

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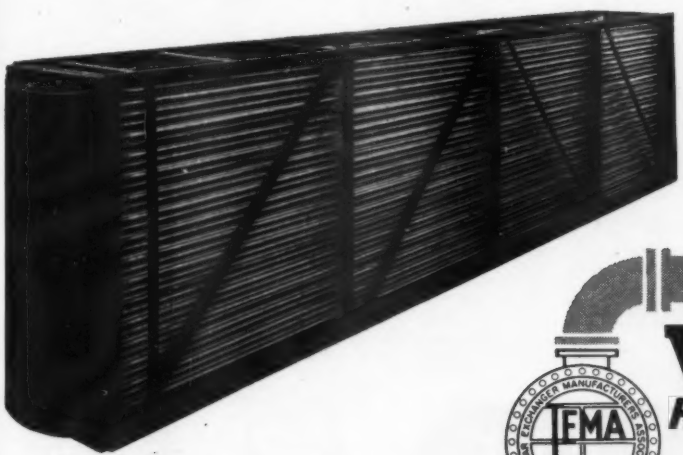

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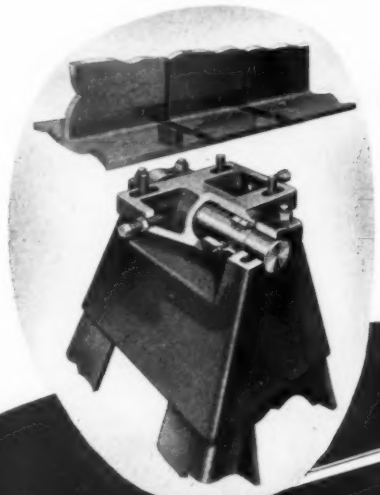
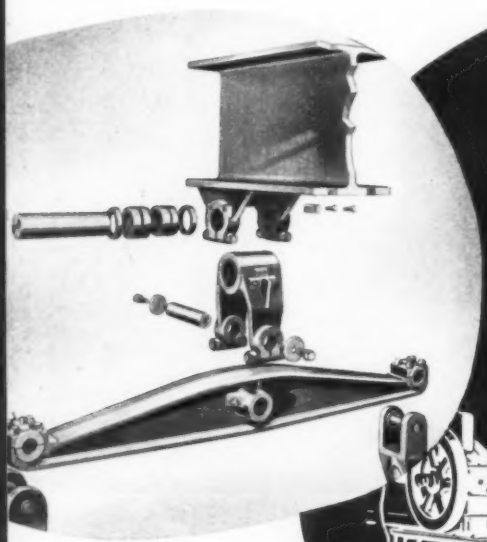
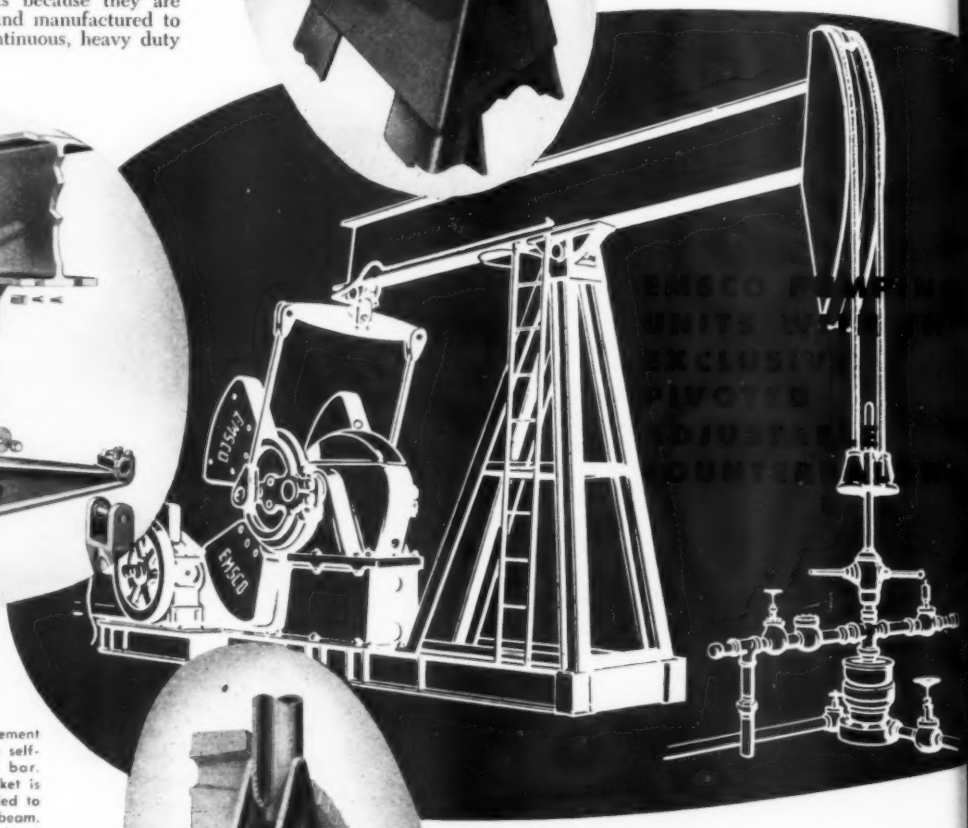


CENTER IRON

Heavy duty, needle roller bearings mounted in the center iron run on a hardened and precision ground shaft clamped to the top of the Sampson post. Bearings are protected by pressure relieved grease seals. Slotted holes and jack screws in center iron allow positioning of the carrier bar directly over the well head.

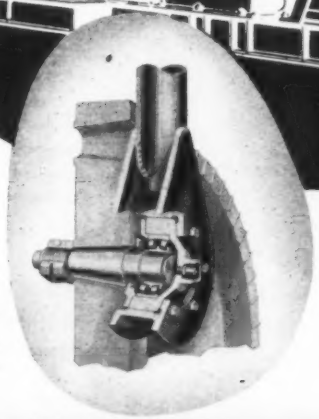




EQUALIZER AND EQUALIZER BEARING

This assembly allows free movement in two planes, giving absolute self-alignment of the equalizer bar. Equalizer hanger bearing bracket is a machined steel casting welded to the bottom of the walking beam. Bearing pin is made of hardened and ground alloy steel. Seal protected needle roller bearings are lubricated from top of the safety ladder.

SEE OUR CATALOG IN THE COMPOSITE CATALOG PAGES 1437 TO 1556



WRIST PIN ASSEMBLY

Self-aligning roller bearings are used in the wrist pin assembly. These self-contained, sealed bearings are safely and easily lubricated by grease fittings conveniently located at the outer end of the wrist pin assembly. Note tapered wrist pin and special lock nuts that positively hold pin in position, yet insure easy removal.

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Progress Report: Midland County

NOTABLE in the trend toward deeper and deeper drilling is the development and exploration activity taking place in Texas' Midland basin, particularly in and near Midland County.

In this area, the deepest portion of the Permian basin, post-Pennsylvanian sediments reach thicknesses of 10,000 ft. in places and the Ellenburger is topped at roughly 13,000 (—10,000) ft. Differences of opinion exist in picking formation tops, but it is generally agreed that shallow structures are flattened reflections of more pronounced structures at depth. If this idea continues to prove true, the area will see some remarkable fields developed in the next few years.

Within the last 2 years, three deep fields and three shallower fields have been proven to lie wholly or partly within Midland County. These fields are being rapidly developed and holes seeking other fields or major extension areas are being drilled throughout the county. There are over 60 rigs active in the area covered by the accompanying map.

Of the deep Ellenburger fields, Pegasus is the oldest and now has 25 wells completed and 20 drilling. Development has been south and eastward from the discovery well, completed in March 1949, so that the field now lies mostly in Upton County. Sweetie Peck field, 3 miles northwest of Pegasus, has 10 completed wells and 12 drilling. This field, discovered in March 1950, is being developed in the Pennsylvanian and Devonian as well as in the Ellenburger. Both Sweetie Peck and Pegasus have shown indications of commercial production possibilities in Permian zones. Neither of the two fields has been laterally defined by drilling. North and west of Pegasus, C. W. Murchison 1 Canon (I on map) is drilling ahead after flowing oil from the Pennsylvanian. Northwest of Sweetie Peck, Vina Bagley Estate 1 Cowden (H on map) has opened a new Wolfcamp area. Newest of the deep fields is Parks. This field was recently given a major extension, in the Pennsylvanian at least, by Magnolia Petroleum Co. 1 Timmerman (G on map).

Permian-Spraberry fields are being developed in eastern Midland County at Tex-Harvey, Germania, and a new field indicated by Humble Oil & Refining Co. 1 Midkiff (J on map). Shows of oil in the Spraberry have been found in other wildcats in the area including Houston Oil Co. 1 Golladay (D on map) and Ashland Oil & Refining Co. 1 Lindsay (B on map). This pay, although normally requiring artificial fracturing, is now producing a large share of Midland County's oil and is apparently due for considerable expansion in the future.

Other important wildcats in the area include Gulf Oil Corp. 1 Glass (A on map) which had oil in the Pennsylvanian. Attempts to complete this well have been temporarily abandoned and an offset is being drilled. Sinclair Oil & Gas Co. 1 Davis (K on map) is being completed in the Ellenburger. The Texas Co. 1 Scharbauer (F on map) is a small producer from the Ellenburger. Cumberland and Weiner 1 Powell (C on map), an Ellenburger test, has not encountered commercial oil production through the Devonian. Ralph Lowe 1 Hill (E on map) has found the "Dean" sand (lower Spraberry) and Wolfcamp productive and is drilling ahead to the Ellenburger.

Roy F. Carlson and Philip C. Ingalls

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

ROCKY MOUNTAIN AREA.—Continental Oil Co. and Standard Oil Co. of California have apparently failed at their first wildcat in the Basin and Range Province of Nevada, with plans for drilling a second deep test in the area. Three new wells found oil and gas in the Nebraska portion of the Denver-Julesburg Basin area. Pond Petroleum Co. found oil in Madison at the first deep test on Lamb Anticline, Wyoming.

WEST TEXAS.—Magnolia's 1 Collins, north offset to its Parks Ellenburger discovery in Midland County, had brighter prospects after being cored ahead to 12,979 ft. Previous drill-stem tests recovered salt water on top of the oil, but last test from 12,960-79 ft. recovered 30 ft. of oil, plus oil-cut mud, with no formation water. Further testing was scheduled for the entire Ellenburger section, as operators believed water might be coming from the Joins section, on top of the Ellenburger.

CANADA.—A tri-zone natural gas discovery in the Countess area of southern Alberta is drilling ahead. The Sun-Great West 1, 78 miles east-southeast of Calgary, tested gas in three horizons of Viking sand equivalent, and is continuing on to Devonian.

MISSISSIPPI.—An apparent discovery in Concordia Parish, Louisiana, may extend into Mississippi and revive interest in Adams County. A new test has already been located in the Mississippi River swamplands, about 6 miles southwest of the Louisiana strike, Sinclair's 1 Sharp, 10-4n-9e.

XUM

Kansas

Barton County Wildcat Shows for Production

NATIONAL ASSOCIATED PETROLEUM CO. appears to have found another new pool in Barton County where its 1 Harris, NE NE SW 30-19-12, 3 miles east of Great Bend and 3½ miles from nearest production, the North Hammer pool to the east, is a prospective producer in both the Arbuckle lime and the Lansing-Kansas City section. Good showings were encountered in both zones, particularly the Lansing-Kansas, from which operators recovered more than 1,000 ft. of clean oil following a 20-minute drill-stem test of interval at 3,157-67 ft. Casing has been run 5 ft. in the Arbuckle, topped at 3,390 ft. (—1,564 ft.) and drilled to 3,399 ft.

Testing is under way at another Barton County wildcat. It is Charles Carlock 1 Klug, SE SE SW 31-16-12, 1 mile southeast of production in the Trapp pool. Total depth is 3,438 ft. in Arbuckle lime topped at 3,418 ft. (—1,562 ft.), and open below 3,423 ft. Showings were found in both the Arbuckle and the Lansing-Kansas City lime, topped at 3,174 ft. (—1,218 ft.). A 20-minute drill-stem test in the latter zone at 3,175-3,210 ft. yielded 93 ft. of oil-cut mud.

Holl & Branine and K and E Drilling Co. have completed their 1 Roessler, NW NW NW 13-18-11, opening another new pool in eastern Barton County. The well, located a mile northwest of production in the Zink pool, pumped 220 bbl. of oil per day on potential tests. Pay zone is the Arbuckle lime, topped at 3,294 ft. (—1,509 ft.), and open at 3,295-98 ft.

Another outpost test in the Landsdown area, eastern Kingman County, near the Sedwick County line, is showing for a possible Mississippian well. It is Pabco Drilling Co. 1-B Viney, SW SW SW 9-28-5, a mile northwest of the Landsdown pool, one of several recent oil discoveries in the area. The well logged the Mississippi chert at 3,761 ft. (2,360 ft.) and the dolomite at 3,786 ft. Hole was cored and drilled to 3,839 ft. with two drill-stem tests being made, the first at 3,786-3,806 ft. and the second at 3,805-15 ft. In the first, with tool open 1 hour, the well flowed at an estimated rate of 1,500,000 cu. ft. of gas per day. Gas was at the surface within 3 minutes after the tester was opened. In the second test, also lasting 1 hour, there was a fair show of gas, and in the pipe break-down following the test there was 60 ft. of gassy mud, 60 ft. of muddy oil, 290 ft. of free oil, and 10 ft. of water. Casing has been run.

Cities Service Oil Co. has extended production of the Hugoton gas field in Haskell County more than 4 miles to the east at its 1 Watson, NE NE SW 26-30s-32w. On open-flow tests following acidizing the well produced at the rate of more than 10,000,000 cu. ft. per day. Casing is perforated in the Permian lime pay zone at 2,606-90 ft.

KANSAS SUCCESSFUL WILDCATS

Ellis County: Nye 1 Karlin, NE SE SW 1-12s-18w, elev. 2,109 ft., 3,000 bbl. oil per day from Arbuckle at 3,638-41 ft., TD; anhydrite 1,360 ft., Heebner 3,306 ft., Lansing-Kansas City 3,348 ft.

Stafford County: Stanolind 1 Foster, NE NE SE 24-21s-14w, elev. 1,926 ft., 118 bbl. 20°-gravity oil per day from Lansing at 3,512-22 ft., 3,544-50 ft., 3,555-59 ft., TD 3,733 ft., anhydrite 812 ft., Sooy 3,621 ft., Viola 3,636 ft., Simpson 3,667 ft., Arbuckle 3,721 ft.

KANSAS WILDCAT FAILURES

Barton County: North American Producing Co. 1 Phillips, SW NW NW 1-18s-14w, elev. 1,833 ft., dry, TD 3,405 ft., anhydrite 788 ft., Heebner 3,026 ft., Toronto 3,039 ft., lime 3,090 ft., Lansing-Kansas City 3,097 ft., Sooy 3,310 ft., Arbuckle 3,355 ft.

National Associated Petroleum 1 McMullin, SW SW SW 3-20s-13w, elev. 1,855 ft., dry, TD 3,535 ft., anhydrite 725 ft., Heebner 3,082 ft., lime 3,197 ft., Lansing-Kansas City 3,215 ft., Sooy 3,441 ft., Arbuckle 3,455 (?) ft.

Armer 1 Rogers, SW SW SE 1-20s-13w, elev. 1,846 ft., dry, TD 3,510 ft., anhydrite 730 ft., Heebner 3,065 ft., lime 3,185 ft., Lansing-Kansas City 3,198 ft., Arbuckle 3,448 ft.

Imperial Petroleum 1 Ames, SW SW SE 25-18s-11w, elev. 1,745 ft., dry, TD 3,139 ft., Heebner 2,856 ft., Lansing-Kansas City 2,990 ft.

N. C. R. A. 1 Smith, NW SW NE 12-18s-11w, elev. 1,778 ft., dry, TD 3,345 ft., anhydrite 563 ft., Heebner 2,880 ft., lime 2,998 ft., Lansing-Kansas City 3,013 ft., Sooy 3,291 ft., Simpson 3,303 ft., Arbuckle 3,318 ft.

Pickerell Drilling et al 1 Davis, SW SW NE 31-19s-14w, elev. 1,907 ft., dry, TD 3,649 ft., Topeka 2,831 ft., Heebner 3,169 ft., Lansing-Kansas City 3,257 ft., Sooy 3,544 ft., Arbuckle 3,604 ft.

Butler County: Gaty 1 Hutton, NE SW SW 12-28s-3e, elev. 1,273 ft., dry, TD 2,975 ft., Kansas City 2,226 ft., Mississippi lime 2,660 ft., Simpson 2,958 ft., Arbuckle 2,973 ft.

Coffey County: Stanolind 1 Butler, SE SE SW 1-21s-13e, elev. 1,121 ft. RB, dry, TD 2,291 ft., Lansing-Kansas City 719 ft., basal Kansas City 1,096 ft., Cherokee 1,392 ft., Kinderhook 2,036 ft., Viola 2,168 ft., Simpson 3,170 ft., Arbuckle 2,232 ft.

Cowley County: Buffalo Oil et al 1 Greoene-Rahn, NW NW SE 1-32s-3e, elev. 1,127 ft., dry, TD 3,375 ft., lime 1,990 ft., Stalnaker 2,000 ft., Kansas City 2,435 ft., Mississippi lime 3,027 ft., Simpson 3,355 ft., Arbuckle 3,360 ft.

Graham County: Aurora Gasoline 1 Driscoll, NE NE NW 14-10s-21w, elev. 2,226 ft., dry, TD 3,862 ft., Topeka 3,245 ft., Heebner 3,457 ft., Lansing-Kansas City 3,496 ft., Sooy 3,785 (?) ft., Arbuckle 3,822 ft.

Gray County: Skelly 1 Slocum, NW NW SE 2-28s-27w, elev. 2,723 ft., dry, TD 6,354 ft., Herrington 2,715 ft., Heebner 4,188 ft., Lansing-Kansas City 4,332 ft., Pennsylvania Sooy 5,121 ft., Mississippi lime 5,136 ft., Viola 5,868 ft., Simpson 5,964 ft., Arbuckle 6,021 ft.

Greenwood County: Davis & Ives 1 Johnson, NE SW SW 8-26s-13e, dry, TD 1,850 ft., Mississippi lime 1,580 ft.

Hinz 1 Weaver, NE NE NE 17-22s-12e, dry, TD 1,852 ft., Bartlesville 1,774 ft.

Haskell County: Cities Service 1 Fleming, NE NE SW 6-28s-31w, elev. 2,891 ft., dry, TD 2,865 ft., Herrington 1,734 ft., upper Krider 2,762 ft., lower Krider 1,782 ft.

Kingman County: Pabco Drilling 1 Viney, SE SE SW 17-28s-5w, elev. 1,415 ft., dry, TD 3,895 ft., lime 2,982 ft., Mississippi dolomite 3,837 ft.

McPherson County: Westgate-Greenland et al 1 Nikkel, SW SW SW 22-20s-1w, elev. 1,514 ft., dry, TD 3,490 ft., Mississippi lime 2,917 ft., Simpson sand 3,438 (?) ft.

Marshall County: Johnston et al 1 Brown, NE SE SW 21-4s-7e, elev. 1,132 (?) ft., dry, TD 2,063 ft., Howard 609 ft., Topeka 647 ft., Heebner 829 ft., Lansing 864 ft., basal Kansas City 1,103 ft., Hunton 1,266 ft., Viola 1,540 ft., Simpson 1,888 ft., St. Peter 1,948 ft., pre-Cambrian 2,000 ft.

Rooks County: Lewis Drilling 1 Baker, SW SW NE 26-9s-18w, elev. 2,152 ft., dry, TD 3,673 ft., anhydrite 1,470 ft., Heebner 3,307 ft., Lansing-Kansas City 3,348 ft., Simpson 3,619 ft., Arbuckle 3,644 ft.

Russell County: National Associated Petroleum 1 Bachman, SE NE SE 26-14s-12w, elev. 1,649 ft., dry, TD 3,200 ft., anhydrite 523 ft., Topeka 2,473 ft., Lansing-Kansas City 2,802 ft., Heebner 2,712 ft., Sooy 3,128 ft., Arbuckle 3,148 ft.

Stafford County: Anschutz 1 Gobin, NE NE NE 33-25s-13w, elev. 1,924 ft., dry, TD 4,455 ft., anhydrite 810 ft., Heebner 3,541 ft., Toronto 3,562 ft., lime 3,707 ft., Lansing-Kansas City 3,730 ft., Marmaton 4,056 ft., Sooy 4,134 ft., Mississippi chert 4,162 ft., Mississippi lime 4,228 ft., Kinderhook 4,243 ft., Viola 4,300 ft., Simpson 4,369 ft., Arbuckle 4,404 ft.

EASTERN NEBRASKA WILDCAT FAILURE

Saunders County: Pyramid 1 Johnson, NE NE NE 33-13n-7e, elev. 1,228 ft., dry, TD 1,663 ft., Dakota 280 ft., Pennsylvanian 342 ft., Heebner 508 ft., Dodge 531 ft., Marmaton 691 ft., Hunton 729 ft., Simpson 1,325 ft., Simpson sand 1,452 ft., granite wash 1,630 ft.

IOWA

In Mills County, Council Bluffs Oil Exploration Trust 1 Thieschafer is nearing its scheduled depth of 2,250 ft. Located in SE SE 6-73n-43w, the rank wildcat had hole full of water at 2,025 ft., and is currently drilling below 2,040 ft.

California

Edison, Cuyama Sectors' Development Outstanding

LOS ANGELES. — Developments in the Edison area of Kern County and in the Cuyama area of Santa Barbara and San Luis Obispo counties continue to be among the most outstanding in California. Other exploratory operations included a potential ⅞-mile extension to a recent discovery in the North Antelope area of Kern County and an extension to the Del Valle field of Los Angeles County.

Edison field developments included two minor extensions and the opening of a new pool. The two extensioners were in the field's Chanac sand, in Sections 27 and 28-30s-29e. In Section 34, Franco-Western Oil Co. 84-34 Frick opened Schist production at 3,989 ft. This is about 500 ft. below the area's regular Chanac production. The Chanac sand proved to be wet in the discovery well, which pumped about 65 bbl. of 23°-gravity crude on a 24-hour test from 3,989-4,075 ft.

In the Cuyama area, the Morales field's Clayton pool was given a ¼-mile northwest extension and in South Cuyama a new producing sand was opened. The extensioner was Richfield Oil Corp. 1 M. L. Howard in SE SW 3-11n-28w. It topped the Morales oil sand at 2,310 ft. and after drilling to 2,642 ft. was plugged back to 2,435 ft. On a 6-hour swabbing test it produced 32°-gravity crude at the rate of about 300 bbl. daily. It was completed as a pumper to give the pool a total of 12 producers.

The new zone discovery in South Cuyama was Richfield 22-6 Hibberd, in NW NW 6-9n-26w, in the southeast portion of the field. It was completed flowing at the rate of 311 bbl. of 35.5°-gravity crude through a 20/64-in. bean in the "Hibberd" sand at 4,170-4,260 ft. This pay was about 165 ft. lower than the top of Dibblee sand production in adjacent wells.

At Del Valle, Southern California Petroleum Corp. drilled a previously abandoned edge well some 1,200 ft. deeper and succeeded in making a 600-700-bbl. flowing producer. The extensioner, 2 Vasquez, NW NW 21-4n-17w, was abandoned in April 1949 after drilling to 5,709 ft. Last month Southern California reentered the well and deepened it to 6,919 ft. in the Del Valle zone.

In Kern's North Antelope Hills field, where Shell Oil Co. last June discovered 15°-gravity production in the Agua sand (Miocene) at 2,267-2,360 ft. Tide Water Associated Oil Co. was attempting to extend production ⅞ mile to the northwest. The potential stepout, 35-14 in 14-27s-19e, on a 1-hour formation test at 2,640-2,692 ft. recovered 900 ft. of oil and mud and 1,130 ft. of salt water. The crude recovered was 14° gravity. Shell's east offset to the discovery, 73X-23, was standing with casing cemented at 2,687 ft.

CALIFORNIA UNSUCCESSFUL WILDCATS

Kern County, Belgian Anticline area: Pacific Western Oil Corp. 35-32, 32-30s-22e, dry, TD 7,130 ft., elev. 1,534 ft.

Sievert area: Troutt Oil Co. 1 Troutt, 34-

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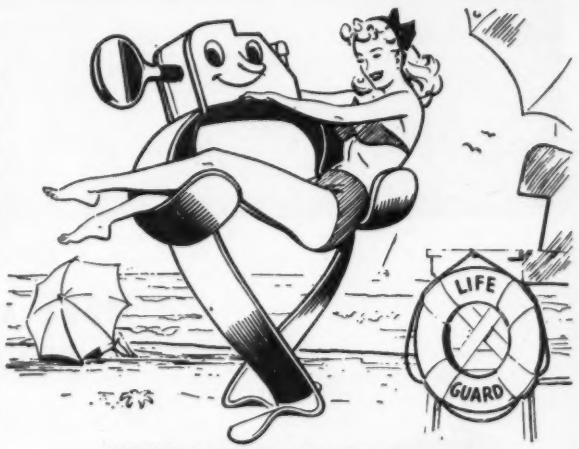

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30s-30e, dry, top granite intrusion 210 ft., base granite intrusion 344 ft., TD 722 ft., elev. 705 ft.

Tejon Hills area: B. K Co. 2 "Well," 14-11n-18w, dry, TD 720 ft., elev. 1,086 ft.

Tunis Creek area: D. K. Associates 51-28 3, 28-11n-18w, dry, TD 1,800 ft.

Orange County, east Richfield area: Kennedy Co. 1 Vejar, 26-3s-9w, dry, TD 4,785 ft., elev. 378 ft.

Santa Barbara County, Santa Ynez area: Ohio Oil Co. 2 Santa Ynez Unit, 6-5n-29w, dry, TD 2,629 ft., elev. 1,750 ft.

CALIFORNIA SUCCESSFUL WILDCATS

Kern County, new Schist pool in South Edison field: Franco-Western Oil Co. 84-34 Frick, NE 34-30s-29e, pumped 65 bbl. 23°-gravity crude and 20 bbl. water on 24-hour test from Schist zone at 3,989-4,075 ft., Chanac 3,430 ft., Schist 3,989 ft., Chanac zone was wet, TD 4,075 ft., elev. 522 ft.

Los Angeles County, extension to Del Valle field: So. Calif. Pet. Corp. et al 2 Vasquez, 21-4n-17w, deepened from 5,709 ft. to Del Valle zone, flowed at rate of 600 bbl. per day from Del Valle at approx. 6,800 ft., 29°-gravity oil through ¼-in. bean, new TD 6,919 ft., elev. 1,403 ft.

Appalachian Field

Christmas Completes Well As Dry in Leidy Township

PITTSBURGH.—In Leidy Township, Clinton County, North Central Pennsylvania, Christmas et al completed 1 Howard Summerson, resulting in a dry hole in the Oriskany sand at 5,955 ft., with water found at 5,957 ft. Total depth was 5,957 ft.; C. E. Fralich et al completed 1 Alice Wyckoff, gaging 3,000,000 cu. ft. of gas from the Oriskany sand at 5,810 ft. Gas was found at 5,810 ft. with total depth 5,826 ft. Initial rock pressure in 36 hours was 3,950 psi.

Godfrey L. Cabot, Inc., completed 2 Jessie D. Calhoun, testing 270,000 cu. ft. of gas from the Oriskany sand at 5,658 ft. with gas at 5,659 ft., and total depth 5,659 ft. Initial rock pressure in this well was 4,075 psi. in 48 hours. A new location has been made by C. E. Fralich et al 1 United States Lumber Co.

In West Bethlehem Township, Washington County, Southwest Pennsylvania, Frank Docktor et al completed a good shallow-sand gas well, 1 Frank Docktor, gaging 1,000,000 cu. ft. from the Big Dunkard sand at 1,223 ft. Gas was found at 1,230 ft.; total depth was 1,236 ft.

Two new locations in Southwest Pennsylvania were reported during the past week: Mahoning and Wayne townships in Armstrong County.

In Steele district, Wood County, West Virginia, United Fuel Gas Co. has located 6651 Ralph Ayers at elevation of 951 ft. It is in the Limestone Hill area, on the Belleville quadrangle, ¼ mile south of Lat. 39°, 5′ and 1.80 miles west of Long. 81°, 30′. A dry hole was completed in this section—Hope Natural Gas Co. 9471 Maggie Ludwig, at elevation of 728 ft., Corniferous lime was found at 4,767 ft., Oriskany sand at 4,877-4,918 ft., with shows of gas at 4,902 ft. and 4,909-18 ft. The gas pays were shot but with unfavorable results. Total depth is 4,929 ft. In Adkin district, McDowell County, Godfrey L. Cabot; Inc., completed 38-1322 Pocahontas Land Corp., gaging 1,565,000 cu. ft. of gas in the Berea sand, with total depth at 4,456 ft. In Harts Creek district, Lincoln County, Owens, Libbey-Owens 9-804 Stein & McComas tested 1,025,000 cu. ft. of gas in the Berea sand and shale. Total depth is 3,578 ft. In Pocatalico district, Putnam County, South Penn Oil Co. completed 3 Frank A. Hardy et al, elevation 816 ft., gaging 2,142,000 cu. ft. of gas in the Oriskany sand with rock pressure 1,120 psi. in 60 hours. Total depth is 4,907 ft. In Ravenswood district, Jackson County, W. W. Dunkle, agent, completed 5-L-549 F. S. Batten with a flow of 40 bbl. of oil in the Berea sand at a total depth of 2,365 ft.

WEST VIRGINIA WILDCAT FAILURE

Wood County, Steele district: Hope Natural Gas Co. 9471 Maggie Ludwig, elevation 728 ft., dry, Corniferous lime 4,767 ft., Oriskany sand 4,877-4,918 ft., show of gas 4,902-04 ft. and 4,909-18 ft., TD 4,929 ft.

Southwest Texas

New Pay Hit in Dilworth Field of McMullen County

CORPUS CHRISTI.—H. R. Smith and American Republics Corp. recorded a flow of 126 bbl. of 42°-gravity oil per day through 5/32-in. choke from a new pay sand in the Dilworth field in McMullen County. The well, 2 J. C. Dilworth, Jr., Rafael Vasquez Survey 42, Abstract 486, is 990 ft. northeast of the 1 discovery well. Total depth of the new producer is 5,876 ft. and production is through perforations at 5,435-41 ft. Tubing pressure was 500 psi. This new field is also the discovery of a salt dome for the area.

New pay has been opened in Donna field, Hidalgo County, at Sinclair Oil & Gas Co. 1 Gomez Unit, Lot 8, Sec. 18, Alamo Land & Sugar Co. Subdivision. Through perforations in the Gomez sand at 6,428-35 ft., the well flowed 247 bbl. of 42°-gravity oil per day through a 14/64-in. choke. Total depth of the well is 9,250 ft. and operators set 7-in. pipe on bottom.

Arnold O. Morgan has completed D-1 R. H. Welder for a new oil discovery 2 miles northwest of Sinton, in San Patricio County. The well has been drilled "tight" and no details are know on the completion.

M. G. Perry is at a total depth of 2,955 ft. in his 1 Rosa Benavides, Webb County wildcat, after running several drill-stem tests. Drill-stem test run at 2,929-33 ft. recovered gas-cut mud; test at 2,933-41 ft. recovered 90 ft. of oil-cut mud; test at 2,938-41 ft., recovered mud; thest at 2,941-50 ft. recovered 190 ft. of oil-cut mud and 50 ft. of salt water. The test is located in Block 7, Sec. 7, Cole Petroleum Co. Subdivision.

Three miles south of Ansley in Hidalgo County, L. M. Lockhart has run a drill-stem test from 8,512-39 ft. in 1 First National Bank of Chicago, 10,000-ft. wildcat venture in Lot 11, Block 3, Alamo Land & Sugar Co. Subdivision, Los Torritos-Maximo Dominguez Grant. Operator used 2,000 ft. of water cushion, ¼-in. choke, and in 15 minutes working pressure was 1,200 psi., with recovery being gas. Bottom-hole flowing pressure was 2,975 psi.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Hidalgo County: New pay at Donna—Sinclair Oil & Gas Co. 1 Gomez Unit, Lot 8, Sec. 18, Alamo Land & Sugar Co. Subd., TD 9,250 ft., top pay 6,428 ft. (Gomez sand), perf. 6,428-35 ft., IP: 247 bbl. oil per day, 14/64-in. choke, TP 500 psi., CP 700 psi., 42° gravity.

Jim Hogg County: Oil discovery "Bruja Vieja"—Pontiac Refining Corp. 1 Y. Vela Cuellar, W. M. Clay Sur., 576, A-162, 18 mi. SW of Hebbronville, TD 1,761 ft., top pay 1,755 ft., open hole 1,755-61 ft., IP: 5 bbl. oil per day on pump, 18° gravity.

Jim Wells County: New pay at Tijerina-Canales-Blucher—The Texas Co. 57 H. C. De Tijerina, AB&M Sur. 359, 2 mi. E of Premont, TD 7,350 ft., top pay 6,903 ft., perf. 6,920-30 ft., IP: 266 bbl. oil per day, ¼-in. choke, TP 1,945 psi., 41.7° gravity.

San Patricio County: New oil pool, "Harvey"—LaGloria Corp. 1 J. H. Harvey, Block 9, Rincon Road Subd., 3½ mi. NE of Gregory, dual comp., TD 9,976

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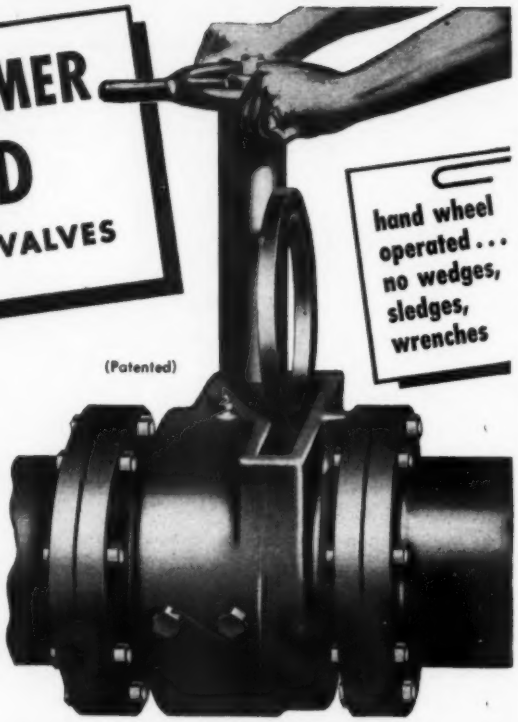

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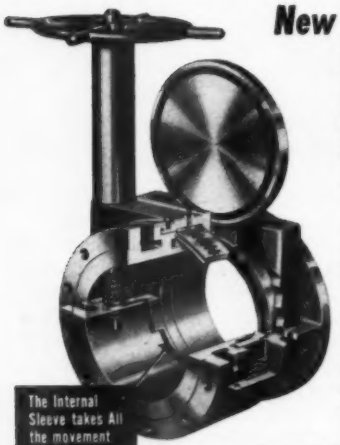

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SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Brooks County: W. E. Fox, Trust, 1 Katie Eravi, J. Eravi Sur. 116, A-200, 1¾ mi. SE of Alta Verde field, dry, TD 5,990 ft.

Gonzales County: Kirkwood & Co. et al, 1 Weber, et al, Thos. Wright Sur., A1472, 3½ mi. SE of Nixon, dry, TD 4,905 ft.

Jim Hogg County: V. G. Schimmel, et al, 1 Leon Vela Pena Sur. 574, 16 mi. SW of Hebbronville, dry, TD 2,110 ft.

Webb County: Magnolia Petroleum Co. 1 Carl Newton Estate, Hopper and Wade Sur. 481, A-1,416, 16 mi. SW of Freer, dry, TD 1,650 ft.

O. W. Killiam A-1 Floyd Billings, SK&K Sur. 712, 11 mi. N of Bruni, dry, TD 3,075 ft.

Sunray Oil Corp. 1 J. O. Walker, Sur. 684, 10 mi. NE of Oilton, dry, TD 10,006 ft.

Oklahoma

Another Oil Discovery Made in Marietta Area

WALTER GANT and E. Dunlap, Jr., have uncovered what appears to be another new pool in the Marietta area, in Love County, in the extreme southern part of the state. Their 1 Liddell, NE SW NE 13-7s-2e, northeast of Marietta, found a sand with good saturation at 5,502-17 ft., and in a drill-stem test flowed at an estimated rate of 20 to 25 bbl. of oil per hour for a short period. Flowing pressure was 900 psi. With the well shut in, bottom-hole pressure built up to 2,600 psi. in 30 minutes. During the test, lasting 60 minutes, gas was at the surface in 5 minutes and oil in 51 minutes. There was 540 ft. of oil in the pipe when the test was pulled. Hole is being deepened to its contract depth of 6,500 ft.

The new discovery has been designated as the East Marietta pool. The location is about 2½ miles southeast of the discovery well of the Northeast Marietta pool, opend last month by the same operators at their 1 Reid, SW SW SW 2-7s-2e. The latter well is producing from Deese sand, opposite which casing was perforated at 6,024-60 ft.

Promising gas showings have been found by Stanolind Oil & Gas Co. in its 1 Slatten, C NW NW 13-9n-18w, deep wildcat test located southwest of Cordell, Washita County, in the western part of the state. In a 60-minute drill-stem test of sand at 9,777-9,832 ft., the well started gassing within 8½ minutes and flowed initially at the rate of more than 620,000 cu. ft. per day. Before the tester was closed, however, the flow had dropped to a rate of less than 570,000 cu. ft. per day. Flowing pressure varied from 225 to 350 psi. Bottom-hole pressure with the well shut in was 4,375 psi. Recovery at the end of the test was 100 ft. of gas-cut mud. Hole is being drilled ahead under a 10,500-ft. contract.

The rapidly developing East Sparks pool in Lincoln County, where good production is found in the Prue sand, is being extended nearly ½ mile further westward by Anderson-Prichard Oil Corp. at its 1 Newcomer, SE NE NW 8-13n-5e. The well topped the pay at 3,499 ft., and with casing cemented through it to 3,555 ft., 1 ft. off bottom, is preparing to perforate for production tests.

B. B. Blair is opening a new productive spot in the Mannford district of Creek County with what appears to be an exceptionally good Dutcher sand well. Their 2 Thompson, NW SW NW 34-18n-9e, ½ mile from nearest production (some old shallow wells) in that district, and 1½ miles north of the Bruce pool, flowed at an estimated rate of 40 bbl. of oil per hour for a short period in a drill-stem test of the Dutcher

pay, and had 1,320 ft. of clean oil in the pipe in the break-down following the test. Saturated sand was logged at 2,803-10 ft., and the test was made of the lower 6 ft. In the test, lasting 21 minutes, there was a good blow of gas with gas showing at the surface within 1½ minutes after the tester was opened. Rate of flow was estimated at 10,000 cu. ft. per day. Oil was at the surface in 20 minutes and flowed the remaining minute of the test. Flowing pressure was 700 psi. With the well shut in, bottom-hole pressure registered 1,025 psi. in 15 minutes. Casing has been run for completion.

OKLAHOMA SUCCESSFUL WILDCATS

Major County: Extension to Ringwood—R. M. Burk 1 Bierig, NE SW NW 8-21n-10w, elev. 1,248 ft., flowed 160 bbl. oil per day from Manning at 6,853-6,980 ft., TD 7,260 ft.

Pawnee County: Trigg Drilling 1 Weirs, SE SE NW 21-20n-8e, est. elev. 943 ft., pumped 3 bbl. 38.5°-gravity oil per day from Red Fork at 2,563-79 ft., TD 2,623 ft., Checkerboard 1,752 ft., Big lime 2,205 ft., Oswego 2,248 ft., Verdigris 2,397 ft., lime 2,541 ft.

Payne County: New pay in Norfolk—R. L. Kemp 1 Houston, NE NE NE 14-18n-5e, 38 bbl. 38°-gravity oil per day from Red Fork and Mississippi lime at 3,190-3,486 ft., TD; elev. 824 ft., Layton 2,100 ft., Big lime 2,815 ft., Prue 2,950 ft., Skinner 3,103 ft., Red Fork 3,189 ft., Inola 3,361 ft., Mississippi lime 3,455 ft.

Foster Drilling 1 Wilson, SW SW SE 11-18n-6e, elev. 781 ft., pumped 20 bbl. 40°-gravity oil per day from Burgess at 3,151-57 ft., TD; Oswego 2,543 ft., coal 2,613 ft., Prue 2,616 ft., Skinner 2,698 ft., lime 2,820 ft., no Bartlesville.

OKLAHOMA WILDCAT FAILURES

Cimarron County: Gilcrist 1 Brummer, C E/2 E/2 NW 8-4n-4ecm, elev. 4,133 ft., dry, TD 5,062 ft., tight hole.

Creek County: Krumme Oil 2 Wheeler, SW SW SE 4-16n-9e, dry, TD 3,124 ft., base Bartlesville 2,023 ft., Dutcher 3,063 ft., shale 3,065 ft., Mississippi lime 3,124 ft.

Jefferson County: Amerada 1 Edwards "A," NW NE NE 4-4s-4w, elev. 880 ft., dry, TD 3,121 ft., Loco lime 1,360 ft., conglomerate 2,716 ft.

Lincoln County: Geological test in Davenport area—T. L. Reed & Son 1 Kimball, NW NE NE 33-15n-5e, elev. 841 ft., dry, TD 5,285 ft., sand and shale 2,500 ft., Checkerboard 2,618 ft., conglomerate 2,705 ft., Oswego 3,390 ft., Prue 3,423 ft., Verdigris 3,550 ft., no Skinner, lime 3,660 ft., no Red Fork, Inola 3,800 ft., no Bartlesville, lime 3,935 ft., Mayes 4,080 ft., Woodford 4,285 ft., Hunton 4,314 ft., Sylvan 4,377 ft., Viola 4,458 ft., first Wilcox 4,522 ft., second Wilcox 4,554 ft.

R. L. Kemp et al 1 Wiseley, SW SW SE 33-16n-4e, elev. 919 ft., dry, TD 4,329 ft., Hogshooter 2,717 ft., Checkerboard 3,038 ft., conglomerate 3,054 ft., Oswego 3,708 ft., Prue 3,749 ft., Verdigris 3,806 ft., sand 3,826 ft., lime 3,986 ft., Bartlesville, 4,118 ft., lime 4,232 ft., Mississippi lime 4,311 ft.

Foster Drilling 1 Marcia, SW SE NE 34-17n-5e, elev. 891 ft., dry, TD 3,687 ft., Checkerboard 2,466 ft., conglomerate 2,503 ft., Big lime 3,030 ft., Oswego 3,056 ft., Prue 3,136 ft., lime 3,158 ft., Bartlesville 3,493 ft., Mississippi lime 3,687 ft.

McClain County: Helmerich & Payne, Inc., 1 Duncan, SE SW NE 11-5n-3e, dry, TD 3,850 ft., Pawhuska 1,530 ft., Belle City 2,110 ft., Layton 2,495 ft., Hunton 3,110 ft., Sylvan 3,226 ft., Viola 3,370 ft., dolomite 3,580 ft., bromide dense 3,644 ft., sand 3,816 ft.

McIntosh County: M. C. Horton 1 Patterson, SW SW SE 26-11n-14e, dry, TD 1,367 ft., sand 725 ft., Booch 1,325 ft.

Pawnee County: B. B. Blair and Amerada 1 Feaster, SE NE SW 4-22n-4e, elev. 1,019 ft., dry, TD 3,718 ft., Pawhuska 1,250 ft., Elgin 1,315 ft., Tonkawa 1,892 ft., Avant 2,090 ft., Dewey 2,363 ft., Osage-Layton 2,573 ft., Hogshooter 2,727 ft., lower Layton 2,745 ft., Checkerboard 3,025 ft., Oswego 3,159 ft., Verdigris 3,398 ft., lime 3,503 ft., Red Fork 3,588 ft., Mississippi lime 3,711 ft.

Eastern Texas

Texaco Wildcat in Anderson County Flows 10 Bbl. of Oil

DALLAS.—The Texas Co. 1 M. T. Holmes, Anderson County wildcat northeast of Tennessee Colony, reported a flow of 10 bbl. of 47°-gravity oil an hour from the Pettit limestone.

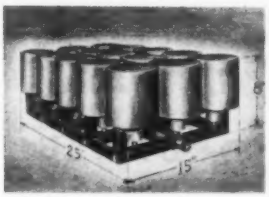
The flow developed following a 1-hour drill-stem test from 9,586-9,622 ft., which recovered 450 ft. of oil and gas-cut water blanket, and a 20-minute test from 9,627-65 ft. which yielded 370 ft. of oil and gas-cut water blanket. The well had salt water in the Rodessa and only light oil shows in the Travis Peak, in drilling to total depth of 10,090 ft.

East of Sandusky in Grayson County, L. O. McMillan, Jr., and Adam Seitz 1 Ellen F. Marshall topped Oil Creek sand at 7,234 ft. and was drilled to 7,248 ft. Electrical surveys indicated water in the sand section and tests had not been made. According to field sources, pipe was to be set around 7,000 ft., for attempted completion in the Pennsylvanian. A test in that formation at 6,864-84 ft. recovered 5,600 ft. of free oil.

A Pennsylvanian well in this new area will add considerable interest. Location of the 1 Marshall is an east offset to the 1 Chambers, discovery well in the Oil Creek sand, of Simpson age.

Ada Oil Co. 1 S. T. Barnes, wildcat 1½ miles southeast of Sandusky, topped the Ellenburger at 7,390 ft., on elevation of 710 ft. Three-hour test from 7,730-50 ft. recovered some 30 ft. of free oil. The well previously made a show for good production in the Oil Creek sand at 7,148-91 ft.

Olson Drilling Co., Tulsa, staked location for its 1 Holder, a semiwildcat southeast



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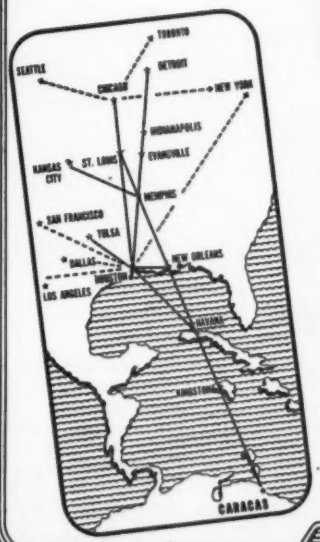

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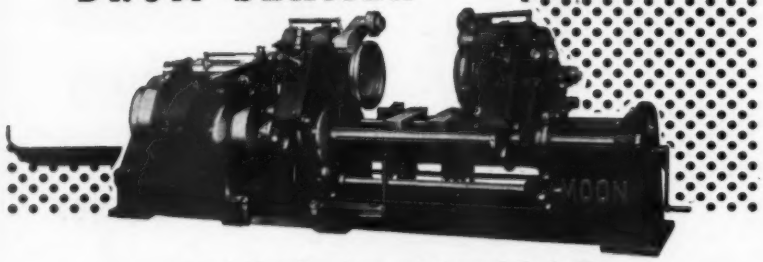

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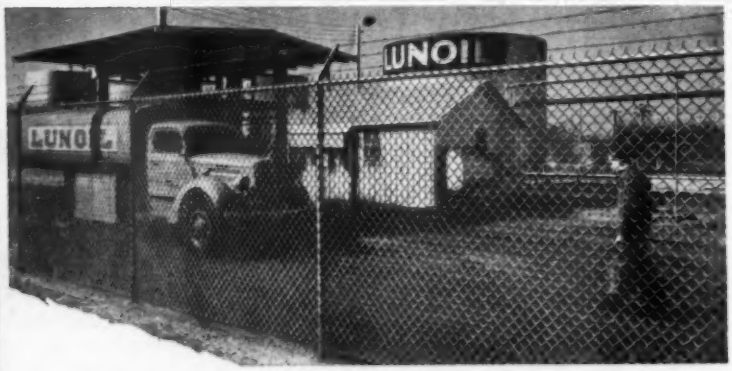

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of Sandusky and ¾ mile northeast of Ada Oil Co.'s 1 Barnes, in the P. C. Parr Survey, A-972. Scheduled depth was 7,200 ft.

In the same area, Roy A. Stamps, Gainesville independent, made location for his 1 Trustees Berry Graveyard. Location in the S. Carmena Survey is about ¾ mile east of the 1 Barnes.

EAST TEXAS (DISTRICTS 5, 6 AND 6-P) WILDCAT FAILURE

Red River County: M. M. Weimberger and E. M. Daniel 1 Norris, Joseph Guest Sur., 1½ mi. SW Detroit, dry, TD 2,000 ft.

Canadian Fields

Countess Wildcat Finds Gas In Three Sand Horizons

CALGARY.—The Countess area wildcat of southern Alberta discovered natural gas in three horizons of the Bow Island sand (Viking sand equivalent) this week, and is now proceeding in search of lower objectives. The well, owned by seven Canadian independents and a large American oil firm, is now heading down for its Lower Cretaceous objective prior to proceeding to its Madison and Devonian prospects.

The tri-zone gas discovery, Sun-Great West 1, is located in LSD 16, 35-20-17w4, about 78 miles east-southeast of Calgary. Latest drill-stem test in the third member of the Bow Island sand, was run of interval 3,215-32 ft. During the 35-minute test, the well rated a maximum natural-gas flow rate of 4,400,000 cu. ft. daily, best test yet run at the well.

First drill-stem test, from 3,038-57 ft., gave a natural-gas flow rate of 3,120,000 cu. ft. daily, while second test from 3,060-79 ft., gave gas at the rate of 900,000 cu. ft. daily.

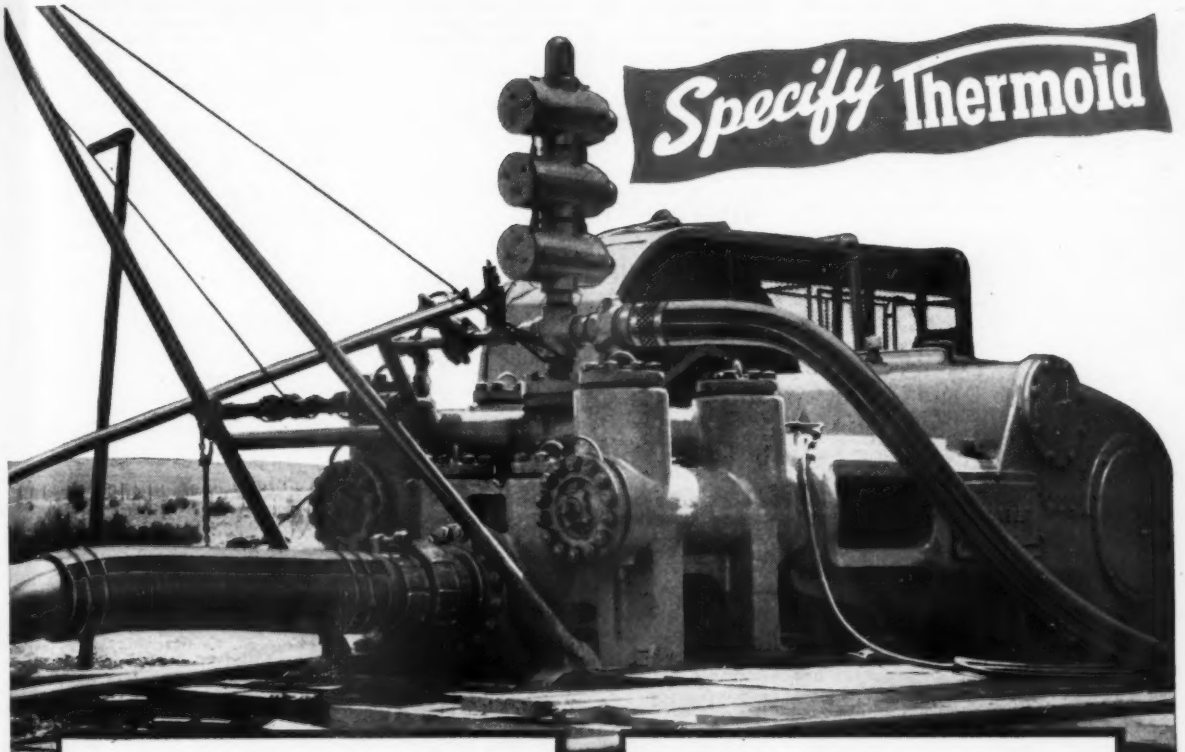
Sun Oil Co., on whose six section farmout tract the well is located, has a 50 per cent stake in the project, while the remaining interest is divided between Great West Exploration Co., Ltd.; Interleduc Oils, Ltd.; Mid-Continent Oil & Gas Co., Ltd.; New British Dominion Oil Co., Ltd.; Lone Rock Oils, Ltd.; Universal Petroleums, Ltd.; and Lloydbrook Oils, Ltd.

Socony-Vacuum Exploration Co. has found natural gas in substantial volume from the Viking sand at its third stepout venture in the Camrose area. The well, Socony-Duhamel, 29-14, LSD 14, 29-45-21w4, has a 1-hour drill-stem test of the Viking interval 3,430-46 ft. and received a gas flow to the surface in 5 minutes, with maximum rate 4,000,000 cu. ft. daily. There was no fluid recovery. Coring is now proceeding at 3,461 ft.

The Duhamel venture is located about 2 miles north of the Socony-Flint 1 dual-zone Devonian oil discovery, about 1⅝ miles northwest of Socony-Camrose 28-1 abandonment, and about 2½ miles northwest of Socony-Ramsey 1 failure. The 29-14 will continue coring and testing the Viking prior to proceeding in search of its Devonian prospects.

Canadian Gulf Oil Co. has fully penetrated D2 zone of Devonian at its recent 1-mile northeast extension oil success at Stettler, and is now looking for D3 zone. The well, Gulf-Ernest Leschert 5, in LSD 5, 14-38-20w4, obtained oil in D2 Devonian last week. The well encountered 100 ft. of D2, but all that zone was not productive. Latest tests in D2 did not give any oil recovery, but gave some natural gas and showings of water.

First D2 zone drill-stem test at the Leschert venture was run of the interval 5,219-32 ft., with natural gas flowing to the surface in 6 minutes and oil in 65 minutes. Estimated flow rate was 30 bbl. of oil hourly. Second test, from 5,232-42 ft., gave gas in 4 minutes and oil in 68 minutes. Flow rate was 45 bbl. hourly. Third test, from 5,241-47 ft., gave gas in 3 minutes and pipe recovery of 25 ft. of mud in



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1 hour. Last D2 drill-stem test, from 5,244-54 ft., gave an initial puff, plus a recovery of 20 ft. of water-cut mud. Crew is now drilling at 5,275 ft., heading for its D3 objective.

The Texaco-British Dominion-Carvel 1 wildcat struck a moderate flow of natural gas and received some showing of oil in the base of D1 zone of Devonian. The interesting wildcat, located in LSD 4, 12-53-2w5, is around 15 miles northwest of Golden Spike field and a little more than that distance west of the Acheson-Stony Plain field.

During D1 drill-stem test of interval 5,350-60 ft. the well gave a maximum natural-gas flow rate of 100,000 cu. ft. daily, plus a pipe recovery of 100 ft. of oil-cut mud and water. Crew is now continuing down in search of D2, with that horizon expected shortly.

CANADIAN WILDCAT FAILURES

Amerada-Crown F43-14, LSD 8, 14-57-16w4, TD 4,320 ft.

Anglo-Socony-Drumheller 1, in LSD 9, 29-28-20w4, TD 6,630 ft.

Imperial-Royce 1, LSD 16, 12-84-8w6, TD 8,014 ft.

Amcan-Texaco-Thorsby 1, LSD 4, 11-49-1w5, TD 6,985 ft.

CANADIAN SUCCESSFUL WILDCAT

Canadian Delhi-Cessford 3, LSD 12, 2-24-12w4, TD 3,286 ft., IP 5,000,000 cu. ft. gas per day.

EASTERN CANADA

In Bruce County, Ontario, Bruce Oil & Gas Co., in process of organization, has submitted to the reforestation committee of the Bruce County Council a proposal to lease part of the Millar Lake County Forest for oil and gas. The area is in Lindsay Township, near the tip of the Bruce Peninsula, and about 60 miles northwest of Owen Sound.

The company proposes to lease for a minimum of 2 years at 5 cents an acre, with ⅛ royalty. The committee has recommended leasing of specified lots, not to exceed 2,500 acres, subject to approval of the provincial minister of lands and forests.

The main potential oil horizon in the area is the Trenton limestone, encountered at around 1,100 ft.

Michigan

Dundee Oiler Completed In Osceola County

MOUNT PLEASANT.—The first oil producer of three follow-up tests to I. W. Hartman et al North Fork Dundee oil discovery in Osceola County, was completed this week at Hartman et al 2 Manley, NW NE SE 33-17n-7w, Orient Township. This successful completion, rated good for about 25 to 30 bbl. of oil a day after acid treatment, was the diagonal northwest 20-acre offset to the discovery. Dundee was logged at 3,797 ft. and hole was bottomed out at 3,808 ft. This offset was reported to be about 4 ft. lower on the Dundee than the discovery and about half as good a producer as the play opener. Hartman staked location for the south offset to the discovery lease, at the NW SE SE 33-17n-7w, a farmout from Sohio Petroleum Co.

After Superior Oil Co. announced that 1 Carnagel Trust, NE NE SW 29-20n-17w, Grant Township wildcat in Mason County, was dry in the Sylvania sand beds at 2,677 ft., the company announced that tools would be moved about 2½ miles southeast, to the SE SW SW 26-20n-18w, for another test of the Sylvania zone.

Ohio Oil Co. 1 State-Custer, NW SW NW 16-29n-7w, Custer Township, Antrim County, was completed in the Traverse at 1,28[illegible] ft., plug-back depth from a dry Richfield total depth of 2,918 ft. and rated good for 3,100,000 cu. ft. of gas a day for a new gas discovery. Traverse gas pay, from 1,070-80 ft., was perforated with 43 shots and pay zone was acidized with 1,000 and 3,000 gal.

MICHIGAN SUCCESSFUL WILDCATS

Allegan County, Heath Township: P. E. Degenther 1 State-Heath, SE SE SW 22-3n-14w, Traverse 1,424 ft., 120 bbl., TD 1,438 ft.

Antrim County, Custer Township: Ohio Oil Co. 1 State-Custer, NW SW NW 16-29n-7w, Traverse 1,069 ft., 3,100,000 cu. ft. gas, TD 2,918 ft., (dry in Richfield), PBTD 1,205 ft., gun perforate 43 shots 1,070-80 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Hopkins Township: Gordon Oil Co. 1 Krizik, SE NE SW 25-3n-12w, Traverse 1,645 ft., dry, TD 1,694 ft.

Laketown Township: Wm. C. Vandenberg, Jr., 1 Bouws, NW NW SE 25-4n-16w, Traverse 1,480 ft., dry, TD 1,484 ft.

Watson Township: Gordon Oil Co. 1 Strandt, SE NW SE 20-2n-12w, Traverse 1,509 ft., dry, TD 1,513 ft.

Arenac County, Standish Township: Frank E. Roush 1 Noffsinger, SE NE SE 25-18n-4e, Dundee 2,691 ft., dry, TD 3,047 ft.

Barry County, Irving Township: Muskegon Development Co. 1 Proctor, SW NW SE 10-4n-9w, Traverse 1,977 ft., dry, TD 2,043 ft.

Bay County, Gibson Township: W. B. Stewart & Walhall Oil Co. 1 Bradley Estate-Whitney, SE SE SW 25-18n-3e, Dundee 2,840 ft., dry, TD 3,119 ft.

Clare County, Franklin Township: Don Rayburn 1 Ladd, S½ SE SE 26-20n-3w, Black lime 5,285 ft., dry, TD 5,375 ft.

Charlevoix County, Boyne Valley Township: Earl Bell 1 Kipisz, NE SE SW 11-32n-5w, Bois Blanc 1,855 ft., dry, TD 2,000 ft.

Mason County, Grant Township: Superior

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Oil Co. 1 Carnagel Trust, NE NE SW 29-20n-17w, Sylvania 2,591 ft., dry, TD 2,677 ft.

Mecosta County, Chippewa Township: Slagter Producing Co. 1 Nott, SE SE NE 31-16n-8w, Monroe 3,860 ft., dry, TD 3,888 ft.

Newaygo County, Sherman Township: W. Spencer Cook, Inc., 1 Thompson et al, NW NW NE 4-13n-13w, Traverse 2,320 ft., dry, TD 2,327 ft.

Van Buren County, Geneva Township: Cook Drilling Co. 1 Provost & Hammond Comm., NW NW SE 1-1s-16w, Traverse 1,154 ft., dry, TD 1,157 ft.

North Central Texas

Two Nolan County Wells Continue Testing Operations

WICHITA FALLS.—Two discoveries in Nolan County continued testing. Sun Oil Co.'s 1 Featherstone, Strawn lime prospect 8 miles south of Sweetwater, was pumping around 50 bbl. of oil a day from pay at 6,160-92 ft.

Rowan & Hope 1 City of Sweetwater in 92-22-T&P, was averaging from 40-50 bbl. of oil a day from Canyon sand pay at 5,242-5,300 ft. The same operators have started a west offset.

A good conglomerate well was in the making at Robert S. Lytle 1 W. B. Stephens, wildcat located 10 miles northeast of Jacksboro in Jack County. At last report the well was ready for completion, having flowed 140 bbl. of 42°-gravity oil in 14 hours, through 15/64-in. choke from pay at 5,080-84 ft.

Lytle & Charles M. Hart are scheduled to drill a southwest offset to the 1 Stephens, as the 1 M. T. Berry. Proposed depth was 5,700 ft.

In southwest Stonewall County, Seaboard Oil Co. 1 Edwards, prospective Canyon reef discovery, was preparing to core ahead from total depth of 5,314 ft. Following acid treatment in open hole between 5,215-5,314 ft., the well made a flow of 25 bbl. of oil in 1 hour and died. It then was swabbed for 15 bbl. of oil and 120 bbl. of acid water in 5 hours; then 45 bbl. of fluid in 4 hours, cutting 3 per cent acid water.

A second pay for the Bowie Viola limestone field of Montague County has been indicated at The Texas Co. 1 Anna Hoeldtke, north offset to the discovery. Sand with oil odor was drilled from 5,280-93 ft., then a 2-hour drill-stem test had gas at the surface in 14 minutes, and recovered 2,750 ft. of oil.

Texaco's 1 Zetsche, south offset to the discovery above, was testing a possible third pay for the area, in the Bend conglomerate. Two-hour drill-stem test from 6,025-61 ft. had gas in the pipe, gas-cut mud and 20 ft. of heavily oil-cut mud, with a small amount of free oil.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Clay County: L. T. Burns 1 D. W. Fuller, Sec: 3246, TE&L Sur., A-607, 1½ mi. E Buffalo Springs, TD 6,554 ft., Ellenburger pay 6,502 ft., pumped 56.4 bbl. 43°-gravity oil a day, GOR 550 cu. ft.

Coleman County: Anzac Oil Corp. 1 C. C. Cason & Crump, League 57, Coleman CSL, 5 mi. SE Coleman, TD 2,076 ft., elev. 1,752 ft., Breneke sand 2,064-74 ft., pumped 63 bbl. 44°-gravity oil a day, GOR 540 cu. ft.

B. H. Nolen 1 B. H. Nolen, J. B. Howington Sur. 184, 13 mi. E Coleman, TD 2,834 ft., Marble Falls 2,737 ft., pay 2,746 ft., pumped 64 bbl. 42°-gravity oil a

Jones County: Con Tex Petroleum Corp. 1 Mabel Killough, 8-16-T&P, 4 mi. SW Hawley, TD 2,065 ft., pay 1,983-87 ft., pumped 50 bbl. 38°-gravity oil a day, GOR 400 cu. ft.

Con Tex 2 M. E. Yeatts, 8-16-T&P, 4 mi. SW Hawley, TD 2,016 ft., perf. 1,973-79 ft., pumped 75 bbl. 38°-gravity oil a day, GOR 500 cu. ft.

Palo Pinto County: W. M. Massie and J. B. Clardy 2 W. C. Bridges, William Metcalf Sur., A-1188, 7 mi. W Graford, TD 1,763 ft., perf. 1,747-54 ft., pumped 14.7 bbl. 40°-gravity oil a day.

Stonewall County: R. J. Caraway 1 John Behringer, Green B. Cook Sur., A-59, 8 mi. NW Rule, TD 5,880 ft., elev. 1,619 ft., Bend conglomerate pay 5,873 ft., flowed 126.5 bbl. 39°-gravity oil a day, 17/64-in. choke, CP 600 psi., TP 100 psi., GOR 375 cu. ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Akin & Dimock 1 Lorena Kinder "A," Clark & Plumb, Blk. 5, 4 mi. SW Scotland, dry, TD 4,017 ft.

Bolin Oil Co. and Regan J. Caraway 1 A. J. Berend, Blk. 4, Clark & Plumb, 3 mi. S Windthorst, dry, TD 5,370 ft., Antelope sand 3,375 ft., Caddo 5,076 ft.

W. C. Young 1 Z. T. Burkett, J. Armstrong Sur., A-762, ½ mi. S Archer City, dry, TD 1,329 ft., Gunsight 1,309 ft.

Brown County: J. A. Green 1 L. N. Guyer, Sec. 22, HT&B, 1 mi. E Bangs, dry, TD 1,185 ft.

F. B. Luker 1 T. E. Denmon, Samuel St. John Sur., 3 mi. NE Brownwood, dry, TD 365 ft.

Coleman County: A. W. Adkisson 1 F. A. Crum, Sec. 279, Wm. Farris Sur., 10 mi. S Santa Anna, dry, TD 2,271 ft.

W. W. Harvey 1 J. E. McCord, J. H. Gibson Sur. 16, 2 mi. N Glen Cove, dry, TD 3,859 ft. in sand.

Cooke County: Britton Drilling Co. 1 H. S. Hickey, J. McLerran Sur., A-781, 4½ mi. E Gainesville, dry, TD 4,352 ft. in shale.

Eastland County: C. W. Phayer 1 McAllister, Sec. 13, H&TC Sur., 3 mi. SW Carbon, dry, TD 3,059 ft., elev. 1,574 ft., Caddo 2,732 ft., Marble Falls 2,990 ft.

Paul R. Wright 1 Abram, 1-2-BBB&C, 2 mi. SW Dotham, dry, TD 512 ft.

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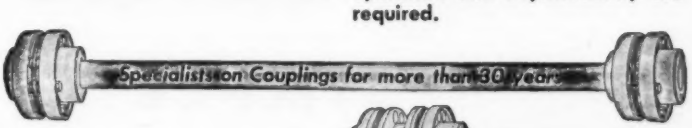

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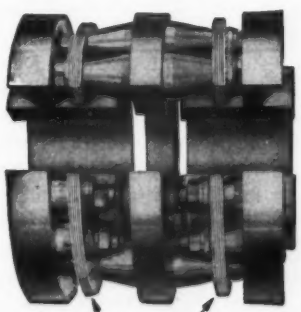

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Jack County: Fred Cone 1-A W. R. Hill, R. A. Johnston Sur., 5 mi. SE Antelope, dry, TD 470 ft.

B. B. Grever 1 H. E. Conway, BBB&C Sur., A-106, 5 mi. SE Antelope, dry, TD 510 ft.

Jones County: Lester & Duffield, Inc. 1 J. P. Bingham "B," Subd. 1, League 359, Goliad CSL, 10 mi. W Anson, dry, TD 3,331 ft., elev. 1,845 ft., Flippen 2,842 ft., upper Hope 2,994 ft., Gunsight 3,138 ft., Swastika 3,187 ft.

Clyde Nelson 1 C. M. Johnston, 43-15-T&P, 2 mi. NE Hawley, dry, TD 2,105 ft., elev. 1,691 ft., Flippen 2,068 ft.

Montague County: General American Oil Co. 1 W. D. Compere, Blk. 2854, TE&L Sur., 3 mi. NW Bowie, dry, TD 6,826 ft., elev. 1,540 ft., conglomerate 6,172-6,201 ft.

Palo Pinto County: W. H. & T. J. Snider 1 C. Chaney, SPRR Sur., A-419, 8½ mi. SW Graford, dry, TD 1,330 ft.

Parker County: Kingwood Oil Co. 1 M. J. Gibson, R. W. Johnson Sur., A-756, 1 mi. NE Veal Station, dry, TD 3,689 ft., elev. 994 ft., Caddo 3,155 ft.

Shackelford County: E. G. Hooker and de Mohrenschildt 1 G. R. Davis "A," 11-13-T&P, 13 mi. W Albany, dry, TD 1,804 ft.

Stephens County: George Myer 1 Porter McConnell, Sec. 2036, TE&L Sur., 10 mi. S Breckenridge, dry, TD 4,290 ft., elev. 1,392 ft., Lake sand 3,570 ft., Marble Falls 3,938 ft., Ellenburger 4,212 ft.

Taylor County: Ray Oil Co. 1 Belle Young, 266-64-H&TC, 20 mi. SW Abilene, dry, TD 5,195 ft., elev. 2,328 ft., Saddle Creek 2,835 ft., Breckenridge 3,128 ft., Palo Pinto 4,525 ft., Capps 4,710 ft., Gardner sand 5,060 ft.

Taubert Drilling Co. 2 M. J. Farr, James Vaughn Sur. 54, 8 mi. SW Abilene, dry, TD 2,189 ft., elev. 1,840 ft., Flippen sand 2,159 ft., lime 2,176 ft.

Throckmorton County: L. H. Choate 2 J. B. Matthews, John Carr Sur., A-186, 15 mi. Throckmorton, dry, TD 905 ft.

Harper & Turner 1 McKnight, Sec. 3091, TE&L Sur., 7 mi. N Throckmorton, dry, TD 5,180 ft., elev. 1,348 ft., Breckenridge 1,365 ft., Gunsight 1,755 ft., Canyon 2,070 ft., Strawn 3,340 ft., Caddo 4,525 ft., Marble Falls 5,045 ft., Chappell 5,090 ft.

P. C. Burns 1 D. S. Portwood, M. Watson Sur., 7 mi. SW Megargel, dry, TD 1,500 ft.

Wichita County: W. A. Lofton 1 Roy Carnes, Blk. 3, Red River Valley Lands, 3½ mi. SE Burkburnett, dry, TD 1,359 ft.

W. A. Lofton 2 Carnes, Blk. 3, Red River Valley Lands, 2½ mi. SE Burkburnett, dry, TD 1,816 ft., Fusalena lime 1,388-92 ft.

Neeld & Hood 1 W. M. Morton, BBB&C Sur., A-333, 6 mi. N Wichita Falls, dry, TD 1,450 ft.

Wise County: Toklan Production Co. 1 B. Johnson, Lee C. Smith Sur., 4 mi. NW Decatur, dry, TD 6,445 ft., elev. 1,032 ft., Caddo 5,056 ft., Marble Falls 6,405 ft.

Young County: Champlin Refining Co. 1 B. Ligon, Sec. 1915, TE&L Sur., 3 mi. NW Loving, dry, TD 5,405 ft., elev. 1,215 ft., Caddo 4,275-4,300 ft., Ellenburger 5,347-5,405 ft.

South Louisiana

Activity in Venice Field Expected to Be Revived

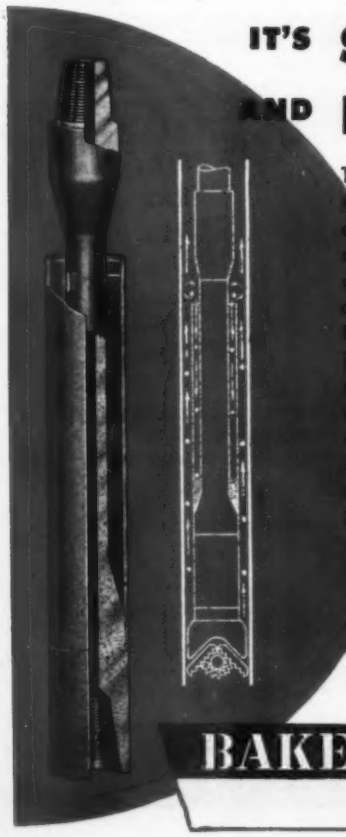
NEW ORLEANS.—Activity is expected to be revived in Venice field, Plaquemines Parish, when results are known of Tide Water Associated Oil Co., Gulf Refining Co., and Humble Oil & Refining Co. 48 Burrus Levee District. Operators have logged a possible 127-ft. sand pay section in the well which is located on the southwest flank of Venice dome. Hole was drilled to total depth of 10,106 ft. and 38 ft. of possibly oil or gas sand were logged from 7,545-94 ft. and an addition 78 ft. from 9,444-522 ft. Operators are currently drilling ahead.

Venice field is considered one of the best reservoirs in South Lousiana, type of structure being piercement salt dome. Production is from the Miocene zone. Other than the 48 Burrus, no wells are active in the field at the present time.

Hunt Oil Co. and associates are rigging up to drill a 9,500-ft. wildcat, 1 Charles B. Petersen, et al, 31-4n-6e, in the extreme northern portion of Avoyelles Parish. New location lies approximately 3 miles southeast of the South Lake Larto field discovery in southern Catahoula Parish, which was completed last year for 21 bbl. of oil per day on pump. Production is through perforations in the Wilcox at 5,835-40 ft. and 5,855-57 ft.

Also in Avoyelles Parish, Gulf Refining Co. has staked location for its second wildcat, 2 Ben J. Altheimer, et al, 24-4n-4e. Test will be drilled to 6,500 ft. Drillsite is approximately 1 mile south-southwest of the company's 1 Altheimer, which showed oil at the 5,900-ft. level in the Wilcox, but in insufficient quantities to make a commercial producer.

The fourth producer in the new Glenmora field, Rapides Parish, has been completed at Texas Pacific Coal & Oil Co. 1 W. F. Gill, 34-1s-2w, southwest diagonal offset to discovery well of the field. The well flowed 146 bbl. of 55.6°-gravity condensate per day through perforations at 10,656-59 ft., under tubing pressure of 2,725 psi. Two other wells in the field are coring for the pay at the present time.



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BAKER JUNK BASKET

PRODUCT NO. 428

Mississippi

Nearby Louisiana Test May Extend Pay to Mississippi

JACKSON.—Across the Mississippi River from Adams County, Mississippi, Sinclair Oil & Gas Co. 1 Sharp, 10-4n-9e, Concordia Parish, Louisiana, logged a total net productive section of approximately 70 ft. in the La Grange section of the Wilcox. It is believed that this discovery may extend to Adams County, Mississippi, thereby reviving interest in that area. Hunter Jones and Stanolind Oil & Gas Co. have staked location and received permit to drill a deep 8,500-ft. Wilcox test approximately 6 miles southwest of the Louisiana strike. The test, 1 Joseph W. Parker, et al, is located in the Mississippi River swamplands, 3-3n-5w, in a relatively untested area of Adams County. Nearest previous test, drilled in 1930, was A. C. Galssel, et al, 1 Belzhoover and Fleming, 1-2n-5w, to the south. Deepest geological marker was the Cockfield at 3,947 ft.

Another Wilcox wildcat has been staked 4 miles north of the new Church Hill field in Jefferson County, Mississippi. Robert Oil Co. and Lyle Cashion Co. 1 Gordon-Stowers, 8-9n-2w, will be drilled to a depth of 6,500 ft. Nearest previous test was Humble Oil & Refining Co. 1 J. F. Gordon, 44-9n-1w, which was bottomed at 11,380 ft. in the Paluxy sand without encountering commercial pay sands.

In the one-well South Carlton field, Clarke County, Alabama, discovered this year, Humble Oil & Refining Co. is testing 2 J. H. Wall Estate, 22-3n-2e. Hole is bottomed at 8,016 ft. and is cased with 5½-in. production string at 5,401 ft. Meanwhile, Humble has commenced operations on its third well for the field, 3 Wall Estate, 10-3n-2e, approximately 1¼ miles northeast of the discovery well.

Efforts to find production on the southeast flank of Soso field, Jones County, Mississippi, failed at Petersen Drilling Co. 1 J. G. Matthews, 32-10n-12w. Operator plugged and abandoned the test at a depth of 6,803 ft. A core taken in the Stanley zone

of the Eutaw included a slight show of gas. Drill-stem test was made of the interval 6,475-82 ft. with recovery being salt water.

Permian Basin

Manning Test Has Another Pay in Pennsylvanian Series

MIDLAND.—Fred M. Manning, Inc., 1 Chester L. Jones, Howard County wildcat northeast of Vincent, reported additional pay in the Pennsylvanian limestone.

A drill-stem test from 7,767-93 ft. ended in 52 minutes due to mechanical trouble. Gas had surfaced in 11 minutes, mud in 26 minutes and oil started flowing out the top in 38 minutes, at the rate of about 2½ bbl. an hour, for the remainder of the test.

Recovery in the pipe was 1,600 ft. of oil and gas-cut drilling mud, and 1,000 ft. of mud with no oil or gas.

A test from 7,788-7,808 ft. produced a light blow at the surface and recovered 210 ft. of lightly oil and gas-cut drilling mud. Formation water had not been encountered. Operators were circulating and waiting on orders.

In Midland County, Magnolia Petroleum Co. 1 H. S. Collings, north offset to its Parks Ellenburger discovery, topped the Ellenburger at 12,910 ft., or minus 10,090 ft., which was correlated 30 ft. high to the same formation in the discovery.

On a drill-stem test at 12,902-957 ft., oil flowed at the surface in 49 minutes. It was flowed into pits for 11 minutes to clean, then turned into tanks through 5/8-in. bottom choke. In 1 hour it gaged a total of 71.55 bbl. of fluid, being 76.3 per cent oil and the balance sediment and salt water.

A test from 12,917-979 ft., open 2 hours and 42 minutes, had gas in 4 minutes, mud in 36 minutes and oil in 40 minutes, which gaged 64.8 bbl. of oil and 15 bbl. of salt water the first hour, and 59.4 bbl. of oil plus 5 bbl. of water the second hour. Operators were drilling ahead below 12,979 ft. in dolomite.

Magnolia's 1 Timmerman, wildcat 12 miles southwest of Midland, had the Ellenburger at 12,917 ft., or minus 10,066 ft. A drill-stem test was under way to 12,940 ft., total depth.

Miami Operators, Inc., of Ballinger, Tex., has announced plans for a 12,000-ft. wildcat in extreme southwestern Reeves County. The proposed test is to be the 1 Balmorhea Ranches, in 84-13-H&GN, 3 miles south of the town of Balmorhea.

Little geological information is known on the area and just what formations will be penetrated in drilling to 12,000 ft. are not known, although estimates have been made from the Permian through the Ellenburger.

Location is about 13 miles southwest of Argo Oil Corp.'s 1 Dora Roberts, which drilled to 14,073 ft. in lime and chert, then plugged back to 10,853 ft. to complete from Wolfcamp pay topped at 9,917 ft. Markers in the Roberts test were: Wolfcamp 9,810 ft., and the Pennsylvanian at 13,670 ft., on elevation of 2,880 ft. Argo drilled a second test 2 miles to the south, as the 1 Ikins, which was dry at 11,250 ft. Elevation on the proposed test is 3,316 ft.

Continental Oil Co. was said to be supporting the venture, with acreage and dry-hole contributions.

In Kent County, General American Oil Co. 1 Spires, 1 mile north of the one-well Spires field, flowed at the rate of 12 bbl. of oil an hour through ¾-in. choke, and later at the rate of 10½ bbl. hourly, and was shut in for storage. Top of the Strawn was 6,743 ft.

Two miles southwest of the Clairmont Strawn field, Gulf Oil Corp. 1 Cairns was drilling lime at 7,546 ft. A 90-minute test from 5,984-6,030 ft., recovered mud and sulfur water. Top of the reef was 6,884 ft.

Humble Oil & Refining Co. 1 Lela Knight was waiting on pumping equipment after swabbing 6½ bbl. of fluid an hour, being about 35 per cent water, from perforations at 7,498-7,503 ft.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Andrews County: Texas Co. 1 J. D. Biles, 15-A31-PSL, 3 mi. W Union field, TD 7,573 fty, elev. 3,443 ft., Wichita Albany porosity 7,390 ft., flowed 329.7 bbl. 37°-gravity oil a day, ¾-in. choke, GOR 456 cu. ft., TP 350-50 psi.

Crockett County: J. R. Stewart 1 Shannon-Phillips, Archer CSL Sur., 2 mi. E Noelke field, TD 1,895 ft., pay 1,798-1,895 ft., 6,000,000 cu. ft. gas.

Midland County: Humble Oil & Refining Co. 1 T. O. Midkiff est., 46-38-4S-T&P, 10 mi. S Tex Harvey field, TD 7,520 ft., PB 7,414 ft., elev. 2,771 ft., Spraberry 7,302 ft., pumped 80 bbl. 33°-gravity oil, 5 bbl. water, GOR 749 cu. ft.

Scurry County: Delta Gulf Drilling Co. 1 H. H. Eiland, 283-97-H&TC, 5 mi. NW Diamond M field, TD 8,230 ft., elev. 2,467 ft., Ellenburger 8,180 ft., perf. 8,182-86, 8,186-90 ft., pumped 87 bbl. 41°-gravity oil a day.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Borden County: Magnolia Petroleum Co. 1 E. M. Conrad, 79-20-LaVaca Navigation Co. Sur., 3 mi. E Reinecke field, dry, TD 8,541 ft., elev. 2,327 ft., reef 7,262 ft., Mississippian 8,390 ft., Ellenburger 8,521 ft.

Kent County: General American Oil Co. of Texas 1 George Beggs, 61-7-H&GN, dry, TD 5,390 ft., elev. 2,285 ft.

National Associated Petroleum Co. 1 Lela Knight, 49-K-T. A. Thompson Sur., 13 mi. S Clairemont, dry, TD 7,305 ft., elev. 2,188 ft., reef 7,030 ft., Caddo 7,138 ft., Mississippian 7,238 ft.

Superior Oil Co. 8-194 H. B. Wood, 194-G-W&NW, 1½ mi. NW Salt Creek field discovery, dry, TD 7,910 ft., elev. 2,165 ft., reef 6,464 ft., Mississippian 7,336 ft., Ellenburger 7,600 ft.

King County: Continental Oil Co. 2 Mary Martin, 173-F-H&TC, 12 mi. SW Guthrie, dry, TD 7,100 ft., elev. 1,982 ft., reef 5,096 ft., Mississippian 6,566 ft., Ellenburger 6,905 ft.

Lamb County: National Associated Petroleum Co. 1 Ewing Halsell, Dalham CSL Sur., 2½ mi. SW Earth, dry, TD 8,900 ft., elev. 3,679 ft., San Andres 4,068 ft., Wichita Albany 5,150 ft., Tubb sand 5,195 ft., Mississippian 8,715 ft.

Martin County: Gulf Oil Corp. 1-E G. W. Glass "B," 13-39-1N-T&P, 11 mi. N Midland, dry, TD 12,915 ft., elev. 2,883 ft., Spraberry 7,882 ft., Pennsylvanian 10,480 ft., Devonian 11,680 ft., Simpson 12,685 ft., Ellenburger 12,770 ft., by samples.

Pecos County: William Y. Penn 1 C. J. Golden, 80-10-H&GN, 4 mi. S Imperial, dry, TD 2,050 ft.

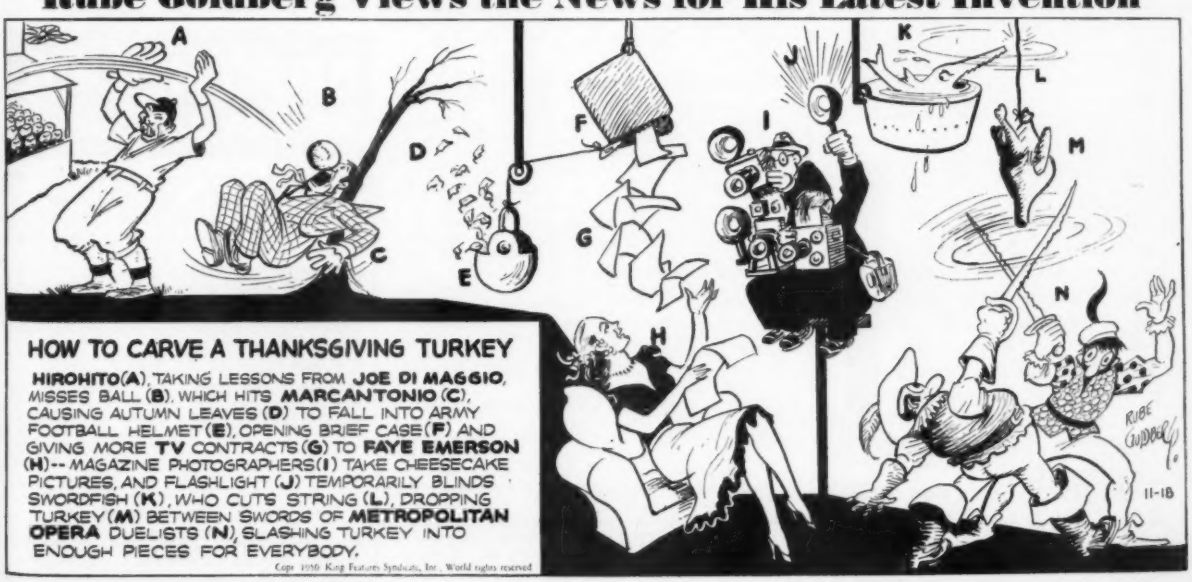
Runnels County: M. J. Mitchell 1 Bertie Crockett, Sec. 543, G. Ross Sur., 4 mi. NE Winters, dry, TD 4,573 ft., elev. 1,836 ft., Capps 3,702 ft., Gardner 4,034 ft., Ellenburger 4,530 ft.

Warren Oil Corp. 1 Joe V. Hinds, Sec. 495, T. T. Williamson Sur., 1½ mi. NE Winters, dry, TD 5,000 ft., Gardner sand 4,288 ft., Caddo 4,580 ft., Ellenburger 4,776 ft.

Scurry County: Cities Service Oil Co. 1-B Burney, 146-97-H&TC, 18 mi. SW Snyder, dry, TD 7,725 ft., elev. 2,260 ft., Canyon 6,795 ft.. Strawn 7,210 ft.

(Continued on page 145)

Rube Goldberg Views the News for His Latest Invention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HOW TO CARVE A THANKSGIVING TURKEY
HIROHITO(A), TAKING LESSONS FROM JOE DI MAGGIO, MISSES BALL (B), WHICH HITS MARCANTONIO (C), CAUSING AUTUMN LEAVES (D) TO FALL INTO ARMY FOOTBALL HELMET (E), OPENING BRIEF CASE (F) AND GIVING MORE TV CONTRACTS (G) TO FAYE EMERSON (H)-- MAGAZINE PHOTOGRAPHERS (I) TAKE CHEESECAKE PICTURES, AND FLASHLIGHT (J) TEMPORARILY BLINDS SWORDFISH (K), WHO CUTS STRING (L), DROPPING TURKEY (M) BETWEEN SWORDS OF METROPOLITAN OPERA DUELISTS (N), SLASHING TURKEY INTO ENOUGH PIECES FOR EVERYBODY.
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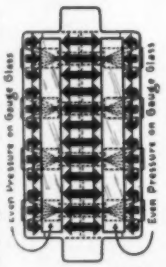

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Texas Gulf Coast

Oil Production Confirmed In New Helen Gohlke Area

HOUSTON.—Oil production has been confirmed in the new Helen Gohlke field, DeWitt County, at Shell Oil Co. B-1 F. W. Gohlke Heirs, southwest offset to the operator's 1 Gohlke, discovery well. Test is being made through jet perforations at 8,140-50 ft., using ¼-in. choke. Meanwhile Shell is rigging up to drill a northeast offset to the discovery, 1 Helen Gohlke, H. C. Kitchen Survey, Abstract 292. Shell considers this its most important Wilcox strike in several years.

In the same county, Hawn Brothers, et al, are testing at 1 E. C. Schaefer, James Duff Survey, Abstract 153, prospective discovery, which recovered oil on two drill-stem tests and condensate on three drill-stem tests. Currently, operators are testing through perforations at 7,610-14 ft., in an oil sand.

British-American Oil Producing Co. has finaled 1 W. P. H. McFadden, et al, wildcat test on the dormant Moss Bluff dome, for 136 bbl. of 30°-gravity oil per day through 8/64-in. choke, with tubing pressure 735 psi. Production is through perforations at 5,856-64 ft.

Paul J. Fly and associates have set long string and are testing their prospective new Basal Frio sand discovery in Goliad County. The test, 1 Lula Swickheimer, et al, W. P. Patterson Survey, Abstract 325, was drilled to total depth of 4,863 ft. and 5½-in. production string was cemented at 4,722 ft. Sidewall samples taken at 4,654-64 ft. recovered saturated oil sand.

In the East Gist area of Newton County, new oil production has been opened with completion of Houston Oil Co. and American Republics Corp. A-1 Hankamer, R. L. White Survey. On initial test the well flowed 230 bbl. oil per day through 10/64-in. choke, under 1,100 psi. tubing pressure. Production is through perforations at 7,195-96 ft. Gravity of the oil was 38°.

A new Wilcox sand field was indicated at a rank wildcat situated 12 miles northeast of Hempstead in northeastern Waller County. Sun Oil Co.-Beaumont 1 Corrine Connell recovered 450 ft. of oil, mud, and gas in addition to 3,000 ft. of water cushion following a drill-stem test made with dual packers set at 10,570 ft. and 10,557 ft. Bottom-hole flowing pressure was 1,435 psi. Operators are reported to have set and cemented the long string after drilling to a total depth of approximately 11,200 ft. Location is 2,970 ft. from the north line and 660 ft. from the east line of the David Scott Survey.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Austin County: New pay at New Ulm—Wood Petroleum Co. 1 Domesle, Thos. Hill Sur., 3½ mi. SE of New Ulm, dual completion, TD 10,826 ft., casing perf. 9,590-601 ft., IP: 101 bbl. condensate per day, 12/64-in. choke, 54.9° gravity, CP 1,386 psi., tubing perf. 9,781-809 ft., new sand, top pay 9,780 ft., IP: 200 bbl. condensate per day, 12/64-in. choke, 49.9° gravity, TP 1,860 psi.

Brazoria County: New oil pool—Floyd L. Karsten 1 V. S. Huffman, J. S. Talmadge Sec. 68, A-561, 5 mi. SE of Arcola, top pay 7,602 ft., TD 8,235 ft., perf. 7,614-16 ft., IP: 126 bbl. oil per day, 7/64-in. choke, TP 1,270 psi., CP 1,365 psi., 41.0° gravity.

New pay and extension at Collins Lake—McCarthy Oil & Gas Corp. 1 M. J. Jamison Estate, C. Smith League, TD 11,475 ft., top pay 11,424 ft. (Hackberry), open hole 11,424-75 ft., IP: 95,000,000 cu. ft. of gas per day, open flow gage, SIP 6,090 psi.

Jefferson County: Gas-condensate discovery—Sun Oil Co. 1 Aubey, John J. French Sur., A-23, S of Hilebrandt Bayou, TD 8,600 ft., top pay 8,370 ft., perf. 8,370-78 ft., IP: 27,000,000 cu. ft. of gas per day, open flow, no gage on condensate, 63.8° gravity.

Liberty County: Gas Discovery—The Texas Co. 3 J. D. Williams, et al, H&TC Sur. 123, A-262, 7 mi. NW of Dayton, TD 2,551 ft., top pay 2,136 ft., perf. 2,136-46 ft., IP: 20,000,000 cu. ft. of dry gas per day, open flow, SIP 1,071 psi.

Newton County: Gas condensate discovery—Earl C. Hankamer, et al, 1 H. L. Brown, James Henderson Sur., A-180, 3 mi. W of Hartburg, top pay 7,198 ft., TD 7,740 ft., perf. 7,198-226 ft., IP: 34,500,000 cu. ft. of gas per day, open flow, no gage on condensate, 62.6° gravity.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Calhoun County: Alcoa Mining Co. 1 Mallory & Ennis, Marciso Cabazos Sur., A-3, 2½ mi. W of Magnolia Beach, dry, TD 8,807 ft.

Galveston County: John W. Mecom 2 Hous-

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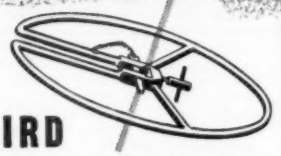

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THE OIL AND GAS JOURNAL

TULSA 1, OKLAHOMA

ton Farms Development Co., Daniel Buckley Sur., Sec. 27, dry, TD 7,800 ft.

Goliad County: Houston Oil Co. of Texas 1 Bertha Wilkinson, et al, Joseph Callaghan Sur., NW of Berclair field, dry, TD 3,450 ft.

Harris County: C. G. Dunwoody, Jr., 1 Clara Lloyd, et al, Reuben White Sur., 1 mi. SE of Sheldon, dry, TD 5,520 ft.

Jackson County: T. J. Ahern 1-B T. N. Mauritz, et al, O. S. York Sur., A-306, 9 mi. S of Ganado, dry, TD 7,402 ft.

Jefferson County: A. W. Franke 1 D. Wiggins Walker, et al, D. Easley Sur., 8 mi. NW of Beaumont, dry, TD 7,010 ft.

Live Oak County: Ryan & Abbott 1 C. L. Terrell Estate, Walter Henry Sur., 4 mi. NW of Three Rivers field, dry, TD 7,151 ft.

Matagorda County: Texas Gulf Production Co., et al, 1 Texas Gulf-Rowan fee, William New Sur., A-333, 3 mi. NE of Francitas, dry, TD 9,803 ft.

Montgomery County: J. S. Abercrombie 1 Glenna N. Aylor, Peter Whittaker Heirs, A-598, dry, TD 9,015 ft.

Orange County: Gray Wolfe Drilling Co., et al, 1 H. J. L. Stark, R. M. Sanders Sur., A-469, 5 mi. N of Vidor, dry, TD 7,491 ft.

Victoria County: Taylor Refining Co. 2 Edwin Fimble, Samuel Wells Sur., A-349, 3 mi. SE of Telferner field, dry, TD 5,761 ft.

Wharton County: Charles H. Osmond 1 Anna Menefee, et al, S. P. Middleton Sur., A-269, 3½ mi. NW of Louise, dry, TD 5,715 ft.

Louisiana-Arkansas

Sinclair's Second Discovery Will Be Concordia's Third

SHREVEPORT.—If Sinclair Oil & Gas Co. brings in its 1 R. B. Sharp et al as a commercial Wilcox producer, it will be the third new pool for Concordia Parish as well as the company's second strike in this parish this year. Over 72 ft. of pay have been encountered in the sand from 6,608-6,967 ft. in the wildcat which is bottomed at 7,498 ft. Operator is currently running production string prior to testing. The well is located 7 miles south of Deer Creek field (the first new pool in the parish this year) which was opened by Carter Oil Co. 1 Graham, 48-5n-9e. The second discovery was Sinclair's 1 Campbell, 7-5n-9e, named Esperance Point field.

In Arkansas, a Miller County test, which had previously shown promise of opening a new area, has had disappointing results on later drill-stem tests. On the latest test (a 2-hour and 50-minute run at 6,303-12 ft. in Rodessa), recovery was 5 bbl. of oil, 200 bbl. of salt water, and 100,000 cu. ft. of gas, with 2,500 psi. bottom-hole and 2,675 bottom-hole shut-in pressure. Operator has squeezed off perforations at the above interval and is now waiting on cement. Total depth is 6,519 ft. Previously the venture, located in 20-18s-27w, had tested an unestimated amount of oil and gas from 6,300-14 ft.

Confirmation of revived production at Grand Cane in DeSoto Parish, Louisiana, is being attempted by L. F. Horn at his 2 Sue Chaffin et al, 4-12n-14w. The operator's 1 Chaffin, in the same section, reopened this area when it produced 100 bbl. of 40°-gravity oil from Paluxy. The current test has 5½-in. casing run to 2,922 ft. with perforations at 2,854-58 ft. in Paluxy. Total depth is 3,008 ft.

East Haynesville field of Claiborne Parish received a dual gas-distillate completion. Producing from Smackover, the well flowed 456 bbl. of 56.4°-gravity distillate and 1,814,000 cu. ft. of gas from "A" sand at 10,038-85 ft., and 408 bbl. of 55.7°-gravity distillate plus 1,553,000 cu. ft. of gas from "B" sand at 10,220-67 ft. Total depth is 10,486 ft.

(Continued on page 145)

Rocky Mountain

Deep Nevada Wildcat Is Apparent Failure

DENVER.—Operations at the first deep wildcat in the Basin and Range Province of Nevada may be stopped soon. Continental Oil Co. and Standard Oil Co. of California are now drilling below 10,072 ft. at 1 Meridian, SW NE SE 31-16n-56e, on their Meridian unit, White Pine County, in the east central part of the state. Formation tops have been released to the Devonian and include Joana limestone (Mississippian) at 3,600 ft., Pilot shale (Mississippian) at 3,676 ft., and Nevada limestone (Devonian) at 3,970 ft. The well has been carried as a tight hole but the operator announced that some shows have been encountered. However, these were definitely not of commercial status. The operators are now reported unitizing their Hayden Creek area, White Pine County, in Township 15n-59e, and plan a deep test on that structure as soon as unitization is completed. The Basin and Range Province has been of interest for the past 3 years and a number of the larger operators have taken extensive lease spreads through the area. The play started in western Utah 3 years ago when Sinclair Oil & Gas Co., Phillips Petroleum Co., and Sun Oil Co. acquired blocks on surface structures.

New gas and oil shows have been found in Denver-Julesburg basin wildcats during the week. Olds Oil Corp. of Casper has cemented casing at 1 Foy, NE NE NE 30-17n-49w, in the Dalton area along the north line of Cheyenne County, Nebraska. This well made 120 ft. of oil on test in Dakota between 4,685-4,702 ft. Casing was cemented at 4,966 ft. and the operator will first perforate at around 4,885 ft. before testing the upper sand. West of previous production in the Nebraska portion of the basin, S. E. & A. C. Torgeson et al., are preparing to run casing at 1 Evertson, NW 24-14n-56w, in the Kimball area, Kimball County. This well is at 6,905 ft., total depth, and some free oil with oil-cut mud was recovered on test of "J" sand between 6,424-35 ft. In the West Sidney area, 2 miles east of a recent Macauley-Dorough gas discovery, Ohio Oil Co. recovered gas with some oil on drill-stem test of "D" sand. At 4,819-25 ft. there was 3,296,000 cu. ft. of gas recovered with 25 ft. of free oil in 35 minutes, and at 4,827-43 ft. the gas blow was 1,695,000 cu. ft. with 125 ft. of green oil. This well is 3 miles south of Dorman oil producing area and 6 miles south of Ohio's Huntsman pool.

A new pay discovery was made during the week in Wyoming. Pond Petroleum Co. acidized its Lamb anticline deep test in Madison and swabbed at the rate of 288 bbl. of oil daily after the treatment. The well is 1 Government, SE SE NW 12-51n-93w, Big Horn County. The new zone was topped at 3,812 ft. Lamb is a known surface anticline on the east side of the Big Horn basin and a small amount of oil has been produced from Tensleep formation.

British-American Oil Producing Co. has a big strike in a 12,000-acre block in the Denver-Julesburg basin at its 1 Koenig & Ashby, NE NW 3-8n-54w, Yenter area, Logan County, Colorado. The well flowed 20 bbl. of 40°-gravity oil per hour from the second Muddy sand. Total depth is 5,250 ft., with casing set at 5,240 ft.

COLORADO SUCCESSFUL WILDCAT

North Sterling, Logan County: Shell Oil Co. 1 Green, SW NW NW 30-9n-53w, (Muddy sand discovery), TD 5,410 ft., PB 4,926 ft., 8⅝-in. csg. at 369 ft., 5½-in. csg. at 5,338 ft., swabbed 3 hrs., flowed 15 bbl. oil first hour, 500 bbl. oil first 24 hours through tubing, Niobrara 4,042 ft., Greenhorn 4,605 ft., Muddy 4,865 ft., Dakota 4,968 ft., Lakota 5,217 ft., Morrison 5,374 ft.

COLORADO WILDCAT FAILURE

Darby Creek, Logan County: Tom Nix-Jess Harris et al., 1 Dotson, C SE NE 27-10n-53w, TD 5,375 ft., dry, Muddy 5,215 ft., Dakota 5,300 ft.

WYOMING SUCCESSFUL WILDCATS

South Cole Creek area, Converse County: Ralph Lowe 1 State, SW NW SW 16-34n-76w, TD 8,564 ft., 5½-in. csg. at 8,537 ft., flowed 238 bbl. oil per day through ¾-in. choke. Teapot 2,627 ft., Parkman 3,113 ft., Shannon 5,133 ft., first Wall Creek 7,278 ft., second Wall Creek 7,899 ft., Muddy 8,386 ft., Dakota 8,520 ft.

South Glenrock: Ralph Lowe, R. A. Goodall and Clark Seargant 1 W. E. Barber, SW NW NE 17-33n-75w, (Muddy discovery new pay), TD 5,815 ft., perf. 48 holes 5,732-40 ft., flowed average 78 bbl. oil per hour through ⅝-in. choke, 7-in. csg. at 5,769 ft., Parkman 785 ft., Shannon 2,640 ft., first Wall Creek 4,708 ft., Muddy 5,732-40 ft., second bench Muddy 5,769-5,800 (?) ft.

WYOMING WILDCAT FAILURE

Embar anticline, Hot Springs County: B. L. Hoover 1 Tribal, C NE SW 16-8n-2e (WRM), TD 2,511 ft., dry, Tensleep 120 ft., Amsden 480 ft., Madison 640 ft., Devonian 1,115 ft., Flathead 2,400 ft., pre-Cambrian 2,503 ft.

MONTANA WILDCAT FAILURES

Southwest Wolf Creek, Carter County: Delhi Oil Corp. 1 Federal-Wheatley, C SE SW 10-9s-56e, TD 2,681 ft., dry, Newcastle 2,132 ft., Skull Creek 2,180 ft., Dakota 2,434 ft., Lakota 2,643 ft.

Delhi Oil Corp. 2 Federal-Wheatley, C SW SW 22-8s-56e, TD 3,160 ft., dry, Newcastle 2,610-30 ft., Dakota 2,930-3,040 ft.

Hingham area, Hill County: Hingham-Hobson 1 Flink, S½ NE NW 25-32n-10e, TD 3,730 ft., dry, Colorado 1,250 ft., Kootenai 2,970 ft., Sunburst 3,260 (?) ft., Ellis-3,310 ft., Sawtooth 3,612 ft.

Flat Willow area, Petroleum County: O'Dillo Rogge 1 Hill, SE SE SE 25-14n-26e, TD 2,108 ft., water well, second Cat Creek 1,670 ft., third Cat Creek 1,810 ft., Ellis 2,085 ft.

Collins area, Teton County: General Petroleum Corp. 8-12-P, SW SW SW 12-24n-2w, TD 3,111 ft., dry, Kootenai 1,050 ft., Morrison 1,340 ft., Swift 1,490 ft., Madison 1,582 ft., Devonian 2,677 ft.

General Petroleum Corp. 88-30-P, SE SE SE 30-25n-1w, TD 4,161 ft., dry, Kootenai 1,015 ft., Swift 1,455 ft., Madison 1,578 ft., Potlatch 2,759 ft., Cambrian 3,818 ft., pre-Cambrian 4,147 ft.

Black Gold, Toole County: Texas Co. 1 State, C NE SW 5-35n-2e, TD 2,615 ft., dry, Blackleaf 920 ft., Kootenai 1,800 ft., Swift 2,156 ft., Sawtooth 2,354 ft., Madison 2,438 ft.

Kevin Sunburst: Lee Edwards 1 Inland Empire, CW½ NE NW 17-35n-1w, TD 4,916 ft., flowed 1 bbl. per day, standing. Kootenai 1,250 ft., Sunburst 1,490 ft., Ellis-Madison 1,688 ft., Devonian 2,810 ft.

NORTHERN NEW MEXICO WILDCAT FAILURE

Rosa, Rio Arriba County: Grady Vaughn 1 Federal, C NW SE 20-32n-5w, TD 3,420 ft., dry, Pictured Cliffs 3,235 ft.

ARIZONA WILDCAT FAILURE

Black Mountain, Apache County: Amerada Petroleum Corp., Stanolind Oil & Gas Co. 1 Navajo, (8,000 ft. S/N 5,000 ft. E/W of Black Mountain Indian Lease), TD 5,765 ft., dry, Chinle 1,150 ft., Shinarump 1,965 ft., Moenkopi 2,025 ft., Coconino 2,780 ft., Supai 3,720 ft., Hermosa 4,920 ft.

NORTH DAKOTA WILDCAT FAILURE

Medicine Buttes, Mercer County: F. F. Kelly (Plymouth Oil) 1 Fritz Leutz, C NW NE 28-142n-89w, TD 12,526 ft., dry, Niobrara 1,856 ft., Dakota 4,690 ft., Sundance 5,040 ft., Spearfish 6,070 ft., Big Snowy 6,620 ft., Kibbey 7,015 ft., Charles 7,310 ft., Madison 7,850 ft., Kinderhook 8,970 ft., Winnepeg 11,885 ft.

Illinois-Ind.-Ky.

Kentucky Wildcat Shows For Good Oil Producer

DISCOVERY of another good pool for Henderson County, western Kentucky, appears to have been made by R. E. Hupp and associates in their 1 J. O. Sawyer, NW NW NE 22-P-25, where casing has been run for production tests of saturation found in the lower O'Hara lime. The prospective pay zone was logged at 2,312-34 ft. A drill-stem test of an interval at 2,310-20 ft. yielded 730 ft. of clean oil and 60 ft. of oil-cut mud with tool open 60 minutes. There was no indication of water. Total depth is 2,338 ft.

The discovery already has been designated as the Oak Grove pool. The location, about 12 miles southeast of Henderson, is about 1¾ miles northwest of the Euterpre North pool. It is about 4 miles south of the active and prolific North Zion pool, opened earlier this year.

F. M. Ashby has extended production and opened a deeper pay zone for the North Zion pool at his 1 D. A. Neal, SE SE NE 3-P-25, which flowed 1,060 bbl. of oil in the first 24 hours. The well, located about ¼ mile north of production at the southeast end of the pool, is producing from the lower part of the McClosky at 2,204-18 ft. Other wells produce from a higher level in that zone. The Ashby well is the first to drill to the lower horizon. It is the largest well to date.

Skiles Oil Corp.'s wildcat in the St. Phillips area, 5 miles west of Evansville, in the southwest corner of Vanderburgh County, Indiana, swabbed at the rate of 3 bbl. of oil natural while cleaning out and testing Cypress sand at 2,358-67 ft. It is 1 Shrode, NW SW SW 18-6s-11w, and is nearly a mile from any other production, the nearest being in the Belknap pool to the east.

Six miles north of Evansville in the NW NE SW 9-5s-10w, Evans & Dobbs Drilling Co. has prospects of a small well in its 1 Schauss, where a 60-minute drill-stem test in O'Hara lime at 2,322-30 ft. got a fair showing of gas and yielded 14 ft. of clean oil and 148 ft. of mud-cut oil. With hole drilled to 2,415 ft., 7-in. oil string has been cemented through the prospective pay zone at 2,371 ft. The location is 2 miles from any other production.

Production at the southwest end of the Rural Hill pool in Hamilton County, Illinois, is being extended ½ mile to the south by Stewart Oil Co. 1 Foster, NE SW SW 22-6s-5e, which got a good oil flow in a drill-stem test at 3,182-3,212 ft. in the Aux Vases section. Tester was open 1 hour. Gas was at the surface within 4 minutes and oil within 45 minutes. Some water was recovered in the break-down.

J. F. Howard has completed his 1 Pauley, SW SW NE 20-1s-10w, 1 mile southeast of production in the East Patoka area, Gibson County, Indiana, as a 110-bbl. pumper. Pay zone is McClosky lime at 1,978-89 ft. Formation had been treated with 2,000 gal. of acid.

ILLINOIS SUCCESSFUL WILDCAT

Richland County: George & Wrather 1 Malone, SW SW NW 17-3n-14w, IP 900,000 cu. ft. gas, Rosiclare 3,198-3,228 ft. (perforated 3,210-27 ft.), TD 3,315 ft. (opens new pool).

ILLINOIS WILDCAT FAILURES

Douglas County: G & H Oil Co. 1 Jones, SW SW NW 1-14n-10e, dry, TD 1,030 ft.

Edgar County: T. W. Drake 1 Newcomer, NE NE SW 27-14n-13w, dry, TD 450 ft.

Effingham County: A. J. Slagter 1 Defebaugh, NE NE NW 30-7n-5e, dry, TD 2,438 ft.

Montgomery County: E. White 1 Johnson, SW NW SE 33-7n-5w, dry, TD 550 ft.

Schuyler County: J. Roan 1 Miller, NW NE NE 13-3n-2w, 4th P.M., dry, TD 627 ft.

Washington County: W. H. Krohn 1 Smith Estate, SE SW NW 35-3s-3w, dry, TD 1,316 ft.

White County: Ashland Oil & Refining Co. et al., 1 Harlem, NW SW SE 15-7n-10e, dry, TD 2,974 ft.

C. E. Brehm 1 DeLap, SE SW NE 5-7s-8e, dry, TD 3,056 ft.

(Continued on page 145)

Ohio Fields

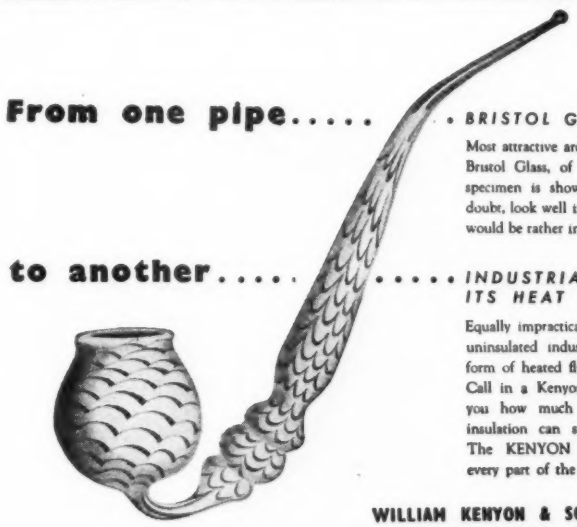
Fourth Oiler Found in Holmes County Area

COLUMBUS.—Oxford Oil 1 T. C. Ramsey, Section 15, Killbuck Township, Holmes County, found the upper Clinton at 3,492-3,504 ft., dry, and the lower sand, 3,511-551 ft., with a good showing of oil. After shooting with 60 qt., the well produced 60 bbl. in 24 hours. This is the fourth oil well to be completed in the area, and should encourage further drilling.

Ohio Fuel drilled in a small gasser on Hina and Abbott in Section 8, Springfield Township, Muskingum County. Clinton was topped at 3,475 ft. and drilled 39 ft. where the gage was 300,000 cu. ft., natural. There is a possibility of oil in the bottom of the sand in this area.

Lancaster City Gas Works has leased a block of acreage in Amanda Township, Fairfield County, and will test the Sub-Trenton on the Brown tract in Sec. 30. No other well in this area reached the St. Peter or Green sand horizon. James Upham has started another deep Clinton well in Warren Township, Tuscarawas County. The location is on I. I. Strahn in Section 21. J. C. Stainer has moved in a rig for a stepout location on A. M. Troyer in Section 22, Lake Township, Stark County.

Locations reported for the week totaled 13, and completions totaled 21.



From one pipe.....

to another.....

from "The Pipe Book" by Alfred Dunhill

• BRISTOL GLASS PIPE

Most attractive are the coloured pipes of old Bristol Glass, of which an unusually fine specimen is shown here. This would, no doubt, look well in a collector's cabinet—but would be rather impractical for every-day use.

• INDUSTRIAL PIPING AND ITS HEAT INSULATION

Equally impractical in modern plants is the uninsulated industrial pipe conveying any form of heated fluid.

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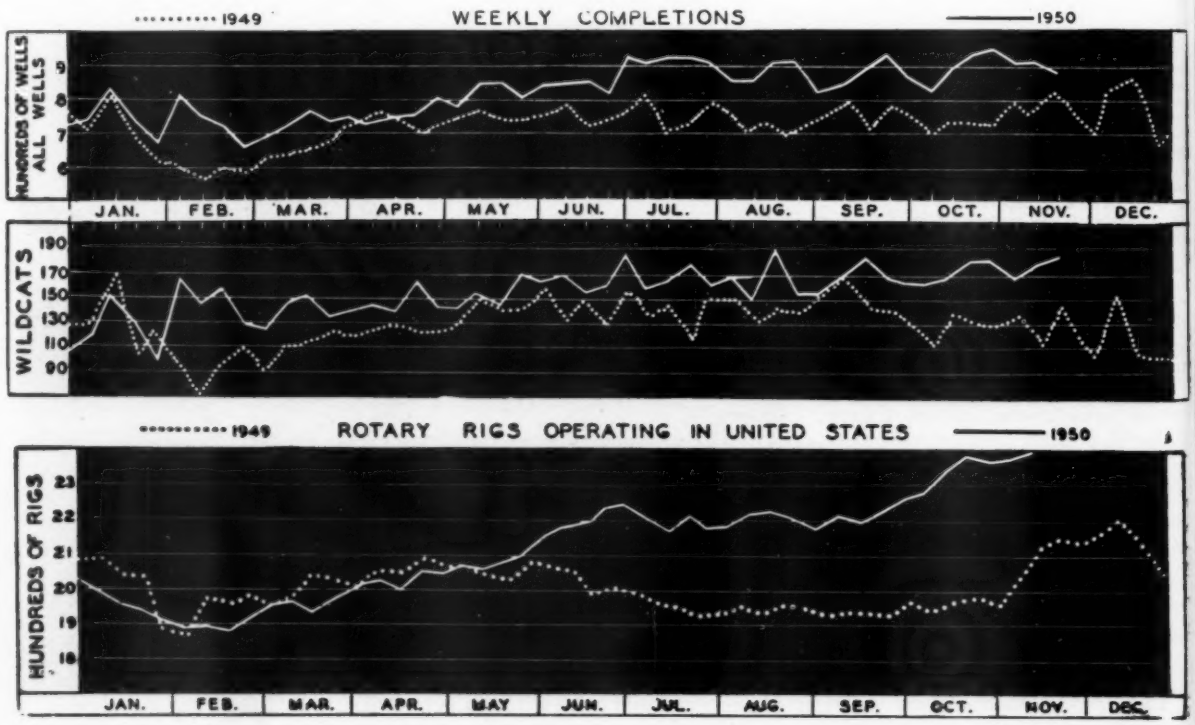
CURRENT STATISTICS

EXPLORATION

WEEKLY WELL COMPLETIONS . . . . . WEEK ENDED NOVEMBER 18, 1950

	Total of all wells					Nov. 18		Wildcat completions and discoveries										
													Cumulative total, 1950					
	Comp.	Oil	Gas	Dry	Footage	1950	1949	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	12	6	0	*6	17,472	612	850	0	0	0	0	0	0	0	0	0	0
Pennsylvania	28	12	3	†13	47,455	1,209	1,409	0	0	0	0	0	0	0	1	3	4
West Virginia	12	2	7	3	38,575	589	465	0	0	0	1	1	0	0	20	19	39
Ohio	21	8	5	‡8	49,514	924	983	0	0	0	0	0	2	0	2	15	19
Indiana	24	7	1	16	46,204	1,474	1,199	1	0	0	2	3	52	0	2	234	288
Kentucky	19	10	0	9	34,156	1,055	898	0	0	0	1	1	25	0	1	88	114
Illinois	57	20	1	‡36	134,768	2,523	2,338	0	0	1	9	10	50	0	3	539	592
Michigan	24	7	1	16	61,646	803	917	1	0	1	11	13	33	0	6	273	312
Kansas	79	37	6	36	250,882	3,457	2,915	2	0	0	20	22	98	0	11	581	690
Nebraska	* 4	2	0	2	11,317	116	31	0	0	0	1	1	6	0	4	50	60
Oklahoma	103	63	3	§37	362,448	4,801	3,822	4	0	0	9	13	144	6	15	584	749
Texas	354	229	14	111	1,623,700	14,596	11,883	15	3	3	64	85	456	43	105	2,358	2,962
North Central (Dist. 7-B & 9)	123	69	2	§52	332,025	4,442	3,957	7	0	0	29	36	199	2	29	925	1,155
West (Dist. 7-C & 8)	98	76	1	21	580,303	4,404	2,892	3	0	1	14	18	87	3	6	470	566
Panhandle (Dist. 10)	15	11	2	2	51,720	803	856	0	0	0	2	2	1	0	2	19	22
Eastern (Dist. 5, 6, & 6-P)	23	17	2	4	112,717	1,014	760	0	0	0	1	1	15	5	3	173	196
Gulf Coast (Dist. 2 & 3)	53	32	4	§17	330,152	2,049	1,747	1	3	2	12	18	75	21	40	350	486
Southwest (Dist. 1 & 4)	42	24	3	15	216,783	1,884	1,671	4	0	0	6	10	79	12	25	421	537
Louisiana	48	30	1	17	282,876	2,171	2,090	2	0	0	6	8	47	16	6	198	267
Northern	30	17	1	12	127,426	1,169	1,252	2	0	0	6	8	13	3	2	99	117
Southern	18	13	0	5	155,450	1,002	838	0	0	0	0	0	34	13	4	99	150
Arkansas	13	10	0	3	32,460	360	292	0	0	0	2	2	10	0	0	80	90
Mississippi	1	1	0	0	4,840	277	308	0	0	0	0	0	10	2	0	104	116
Southeastern States	0	0	0	0	0	52	43	0	0	0	0	0	1	0	1	28	30
Montana	30	14	2	14	70,186	244	238	0	0	0	8	8	1	0	0	43	44
Wyoming	8	6	0	2	36,326	522	527	2	0	0	1	3	23	0	1	77	101
Colorado-Utah	7	3	1	3	36,366	98	125	1	0	0	1	2	5	0	3	57	65
New Mexico	7	3	1	3	20,138	541	457	0	0	0	2	2	11	1	3	51	66
California	32	23	0	9	136,074	1,586	2,284	2	0	0	6	8	25	0	4	341	370
Miscellaneous	¶2	0	0	2	18,291	49	24	0	0	0	2	2	0	0	0	24	24
Total United States	885	493	46	346	3,315,694	38,059	34,098	30	3	5	146	184	990	68	188	5,747	7,002
Total previous week	913	494	58	361	3,313,187	....	....	21	1	3	154	179	969	65	183	5,601	6,818
Total November 18, 1949	824	451	59	314	2,811,429	....	....	18	0	8	118	144	835	74	176	4,952	6,037

Service wells included: *6, †11, ‡2, §1. ¶Incl. 1 Ariz. at 5,765 ft. and 1 No. Dak. at 12,526 ft.



DAILY AVERAGE PRODUCTION FOR WEEK

	Nov. 18 crude oil	B. of M. Nov. demand	Nov. 11 crude oil
Alabama	2,300	1,600	2,400
Arkansas	81,300	88,000	82,800
California	956,700	950,000	952,700
Colorado	75,200	67,000	76,450
Eastern	66,600	65,000	66,600
Florida	1,825	1,400	1,875
Illinois	171,000	184,000	176,400
Indiana	29,800	31,000	31,000
Kansas	305,100	306,000	302,700
Kentucky	29,900	30,000	30,000
Louisiana	582,100	606,000	585,550
North Louisiana	114,100	.....	117,550
South Louisiana	468,000	.....	468,000
Michigan	41,400	47,000	40,800
Mississippi	104,800	110,000	104,600
Montana	22,300	24,000	22,400
Nebraska	5,400	5,000	5,100
New Mexico	130,925	150,000	130,925
Oklahoma	493,900	466,000	492,250
Texas	2,535,200	2,350,000	‡2,560,525
Dist. 1 (Southwest)	31,200	.....	31,200
Dist. 2 (Southwest)	148,725	.....	148,725
Dist. 4 (Southwest)	225,350	.....	235,775
Dist. 3 (Gulf Coast)	443,450	.....	443,450
Dist. 5 (Eastern)	42,850	.....	42,850
Dist. 6 (Eastern)	98,050	.....	‡98,050
East Texas field	291,000	.....	291,000
Dist. 7-C (West)	71,450	.....	71,450
Dist. 8 (West)	871,600	.....	886,500
Dist. 7-B (W. Central)	71,875	.....	71,875
Dist. 9 (N. Central)	149,650	.....	149,650
Dist. 10 (Panhandle)	90,000	.....	90,000
Utah	3,400	4,000	3,650
Wyoming	177,900	184,000	166,100
Total United States	*5,817,050	5,670,000	‡5,834,825
Change from prev. week, down	17,775		
Canada	100,180	.....	92,512

Total U. S. production January 1-November 18 .. †1,731,934,225 bbl.
Same period last year (crude plus cond.) ..... 1,633,508,470 bbl.

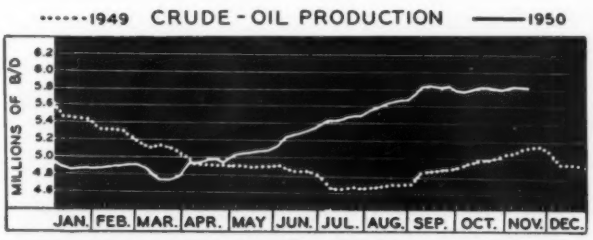
*Not including 99,450 bbl. condensate. †Including 31,404,170 bbl. condensate. ‡Revised.

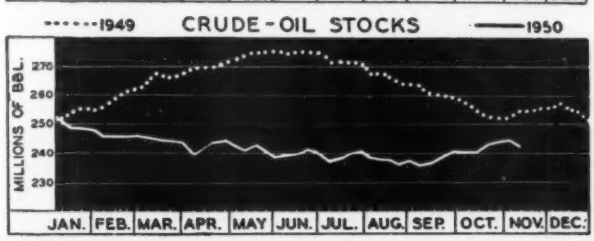
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

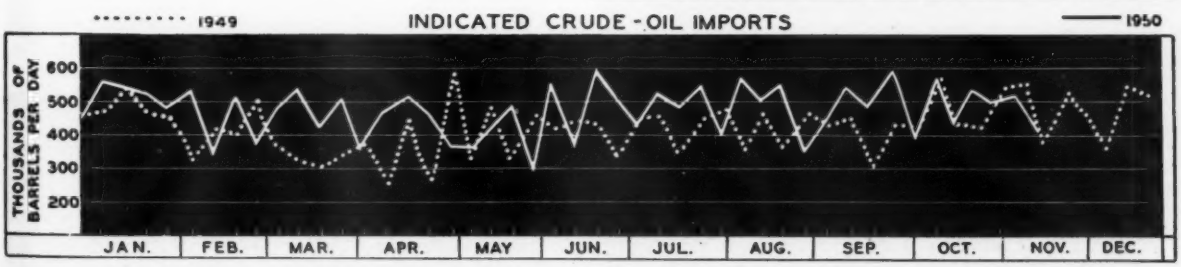
(Thousands of barrels)

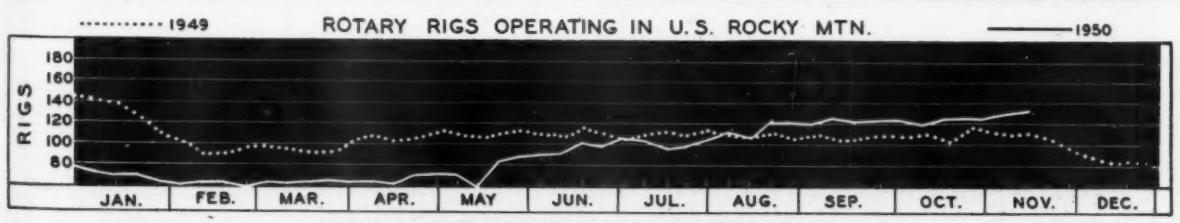
	Nov. 11, 1950	Nov. 4, 1950	Nov. 12, 1949
Pennsylvania Grade	2,311	2,254	3,147
Other Appalachian	1,298	1,388	1,952
Illinois, Indiana, Michigan	10,128	9,674	11,793
Arkansas	2,453	2,357	2,575
Louisiana	13,481	13,839	13,453
North	2,809	3,085	3,471
Gulf	10,672	10,754	9,982
Mississippi	1,886	2,135	2,468
New Mexico	6,586	6,999	7,444
Oklahoma and Kansas	37,797	37,834	36,491
Texas	118,638	120,337	115,640
East Texas	14,563	14,618	16,249
West Texas	46,491	45,923	44,380
Texas Gulf	29,100	28,863	29,938
Other Texas	28,484	30,933	25,073
Rocky Mountain	11,465	11,078	13,902
California	30,308	30,537	37,836
Foreign	5,888	6,503	7,610
Total	242,239	244,935	254,311

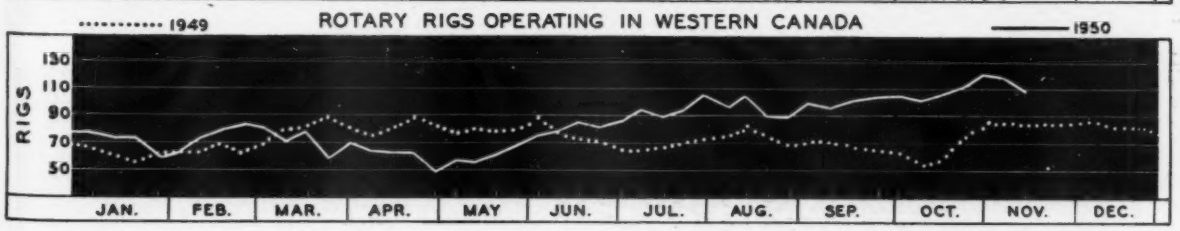
*Bureau of Mines.









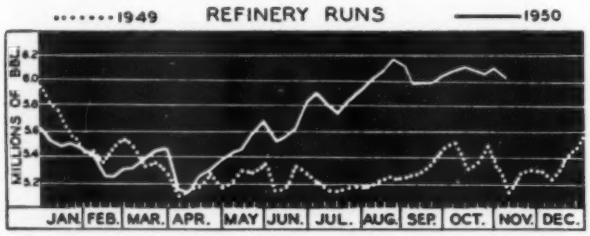


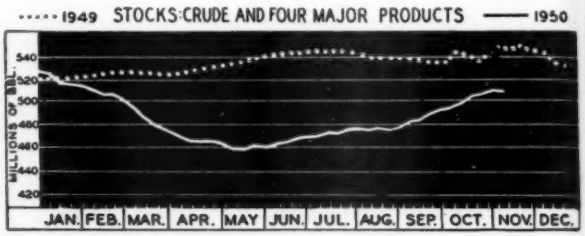
A.P.I. REFINERY REPORT, NOVEMBER 11

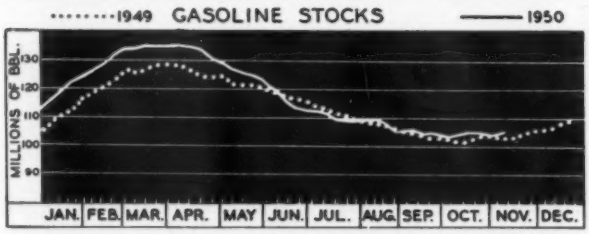
(Thousands of barrels)

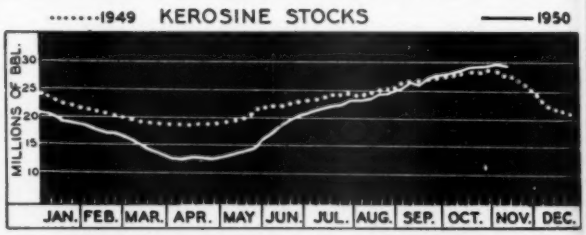
District—	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, November 1949				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
East Coast	959	372.2	32.6	222.0	230.1	24,983	11,513	28,081	11,785	760	322.0	26.7	158.7	190.4
Appalachian:														
District 1	88	40.4	5.1	13.3	11.4	2,709	491	987	473	92	41.7	5.8	12.4	9.5
District 2	69	31.1	3.3	7.1	14.0	1,137	218	288	153	55	26.5	3.5	5.8	11.0
Ind., Ill., Ky.	1,062	556.9	65.4	181.4	149.7	20,736	6,143	15,168	4,985	932	492.5	62.7	144.7	163.9
Okla., Kans., Mo.	464	258.4	19.3	97.2	54.3	10,524	1,488	8,934	1,347	426	240.7	15.4	87.6	58.9
Inland Texas	208	148.6	10.0	33.3	37.7	3,469	528	1,308	665	207	143.2	12.7	25.6	41.8
Texas Gulf Coast	1,435	653.7	99.1	310.4	273.8	16,504	4,301	13,578	6,537	1,279	615.5	104.0	253.2	250.4
La. Gulf Coast	491	213.7	53.8	119.6	57.9	6,172	2,740	3,758	2,335	443	228.9	53.6	103.6	59.4
N. La. and Ark.	75	28.9	7.3	17.4	5.6	2,209	452	833	178	81	31.9	7.8	11.1	16.2
Rocky Mountain:														
New Mexico	14	7.6	.4	2.7	3.9	90	25	41	29	12	7.0	.4	1.8	3.3
Other Rocky Mtn.	200	82.7	4.9	38.0	45.7	2,687	363	1,986	750	162	76.2	6.5	25.7	32.9
California	953	386.7	15.9	167.0	349.6	14,245	741	11,759	15,903	844	367.8	10.0	132.2	342.7
November 11, 1950	6,018	2,780.9	317.1	1,209.4	1,233.7	105,465	29,003	86,721	45,140	5,293	2,593.9	309.1	962.4	1,180.4
November 4, 1950	6,117	2,879.4	329.9	1,249.6	1,207.7	104,350	29,115	86,886	44,689	.....	.....	.....	.....	.....
November 12, 1949	5,127	2,526.6	298.9	978.4	1,116.3	103,577	27,622	92,117	68,527	.....	.....	.....	.....	.....

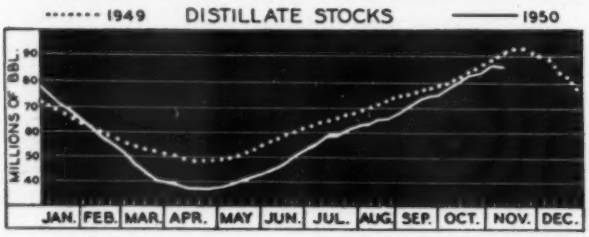
*At refineries including natural blended. †Finished and unfinished.

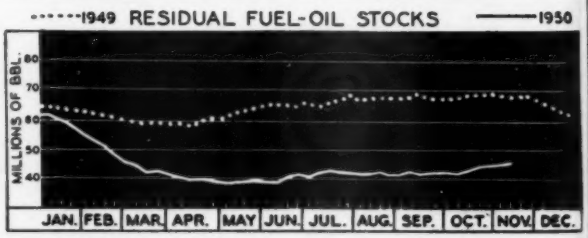


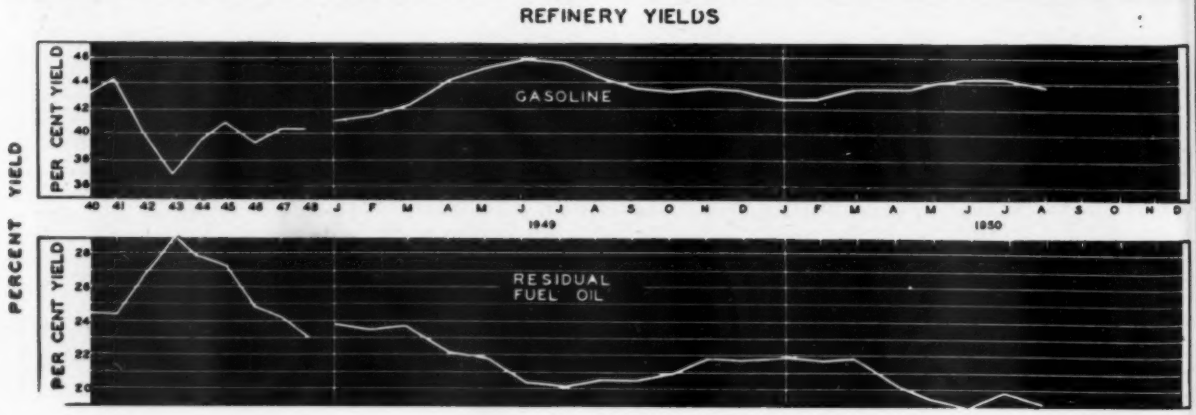












CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.‡	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.76	...	...	....
19-19.9	1.83	...	....	....
20-20.9	1.90	$2.25	....	$2.12
21-21.9	1.97	2.27	....	2.14
22-22.9	2.04	2.29	....	2.16
23-23.9	2.10	2.31	...	2.18
24-24.9	2.17	2.33	$2.56	2.20
25-25.9	2.24	2.35	2.58	2.22
26-26.9	2.31	2.37	2.60	2.24
27-27.9	2.37	2.39	2.62	2.26
28-28.9	2.42	2.41	2.64	2.28
29-29.9	2.48	2.43	2.66	2.30
30-30.9	2.54	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.64	2.49	2.72	2.36
33-33.9	...	2.51	2.74	2.38
34-34.9	...	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	...	2.59	2.82	2.46
38-38.9	...	2.61	2.84	2.48
39-39.9	...	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947.

‡Standard Oil Co. of California

FLAT CRUDE PRICES

Representative posted schedules per barrel.

East Texas†	$2.65
Kettleman Hills, California*	2.77
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	4.10
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

SOME increase in the stability of the gasoline market in eastern states is indicated by the ending of the service-station price war that has disturbed the New Jersey market for the past 3 months. Prices moved back to normal after some of the dealers handling unbranded gasoline raised their prices to levels considered normal compared with advertised brands. Also, at least one major company had notified its dealers that there would be no more price rebates.

The ending of the price war was due in part to the generally unbalanced conditions for Gulf Coast and East Coast markets. Marketers were faced with the fact that the price cutting was bringing selling prices below replacement costs. Unbranded gasoline on the New York Harbor market is quoted at 11.75 cents a gallon for barge deliveries. Most suppliers are asking 10.75 cents for this grade of gasoline on the Gulf Coast, and transportation amounts to 1.4 cents at latest tanker rates.

Some suppliers have predicted that tanker rates by the end of the winter will be twice the Maritime Commission base or three times the rate at which crude and products were moving as late as last May.

Cooler weather in the North Central area has brought an increase in shipments of No. 2 fuel out of the Mid-Continent. Several suppliers reported shipping instructions against contracts were normal for this time of year. The weather in the North Central area through the first week of November was slightly warmer than last year and much warmer than normal for the area, but temperatures have been lower since that time.

Primary gasoline stocks in the Mid-Continent on November 11 were at the September 30 level.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotation of leading suppliers as of November 20, 1950. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10⅜-10½	11.75-12.75	10¾-11
Premium gasoline, 86-88 octane	11¼-11½	13-13.75	11½-12
42-44 w.w. kerosine	8⅞-9⅛	10-10.1	8½-8¾
No. 2 straw fuel oil	8⅛-8⅜	9	7½-7¾
No. 6 residual	$1.65-1.75	$2.15	$1.75-1.85

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6⅜	5⅞	6⅛
Grade 18-55	7.65	7.15	7.4

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	12.5-13.5
750 vis., No. 3-4 neutral	14.75-16
2,000 No. 5-6 neutral	16.5-19

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock 0-10 pp.	27-28
200 vis., No. 3 neutral, 0-10 pp.	16.5-18.5

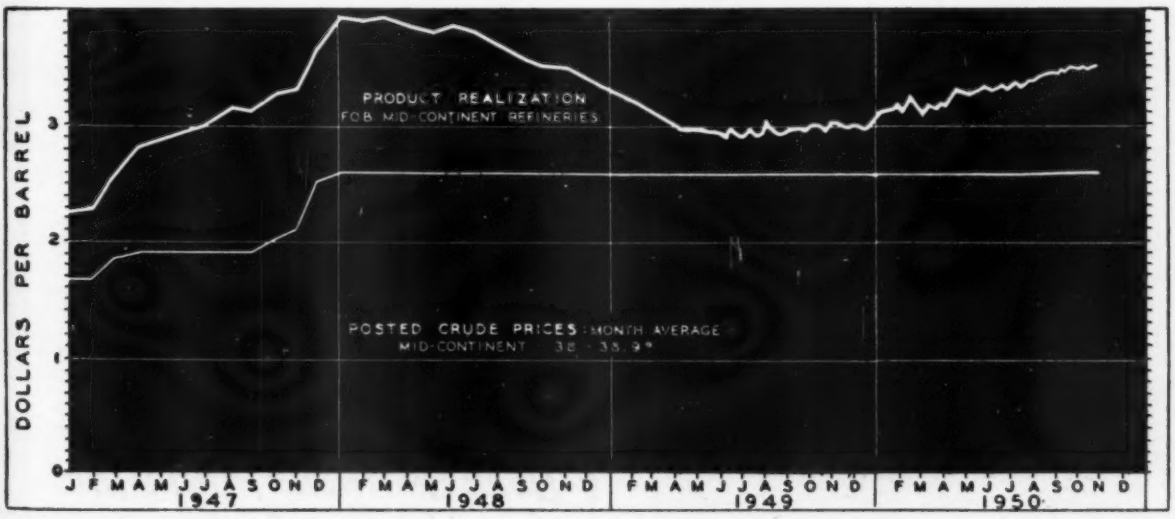
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	29.5
180 vis., 0 p.t. neutral	30.5

WAX

Mid-Continent

132-134 A.M.P.	5.0



In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil. Realization averaged $3.51 for week ended November 11, $3.48 for previous week, and $3.02 for November 1949.

HENRY H. PARIS DISTRIBUTOR Inc.

Manufacturer's Agent - Oil Well and Refinery Supplies

P. O. BOX 932 — 1125 ROTHWELL ST.

HOUSTON, TEXAS

Harrisburg Forged Steel Flanges - Seamless Pipe Couplings

Harrisburg Drop-Forged Steel Pipe Flanges meet every test of strength and safety. Their unvarying uniformity merits your consideration wherever quality is essential. Made to ASA standards.

Harrisburg Forged Seamless Steel Pipe Couplings are uniform in strength and quality. Threads will not strip under most severe strain. Manufactured to API specifications.

Agent and Distributor for the following Nationally known Manufacturers

W. C. NORRIS MANUFACTURER, INC.
Tulsa, Oklahoma
Quality Pumping Equipment, Swage Nipples, Bull Plugs, Welding Fittings, etc.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS

THE OHIO INJECTOR COMPANY
Wadsworth, Ohio
OIC VALVES, Bronze, Iron, Cast and Forged Steel for all purposes.

HARRISBURG STEEL CORPORATION
Harrisburg, Pennsylvania
Forged Steel Flanges and Seamless Casing Couplings.

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

OIL STATES EQUIPMENT COMPANY
Houston, Texas
OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

DRESSER MANUFACTURING DIV.
Bradford, Pa.
Seamless Welding Fittings.

WESTERN SAFETY BARREL STAND STEEL FORGINGS, Inc.
Shreveport, La.
Weld Saddles.

90 Deg. DRESSER ELLS

Made by an exclusive process from seamless steel pressure tubing, meeting ASTM A-234 standards. Dresser Ells are cold formed to assure optimum physical properties of the metal. Center-to-face dimensions held to one and one-half times the nominal size. Minimum wall not less than thickness of specified pipe. Straight tangent on both ends means, 1) Weld removed from plane of greatest stress. 2) Straight bead welding permitted. 3) Pipe alignment simplified.

FOR LIQUIDS, GASES, PROPANE, HOT ASPHALT, STEAM, ACIDS AND OTHER CHEMICALS

For oil refineries, chemical plants, processing, pipelines, drilling, truck and tank car loading racks. Individual joints or multi-joint flexible steel hose, RAMSCO's patented method of packing offers proven dependability for continuous or occasional rotation service.

360° FREE ROTATION—1, 2 AND 3 PLANES

Your particular piping problems solved. You name it—we have it. Over 500 sizes, types, styles. Sizes: ⅛" to 14" low pressure; ⅜" to 6" high pressure. Corrosive service or steam fittings 1000 psi. and temp. to 750° F., asbestos or Teflon packed. Low pressure fittings to 1000 psi. and temp. to 225° F. High pressure fittings to 15,000 psi. and temp. to 225° F. Gear driven types available.

Send for complete catalog and prices. State kind of service, pressure, temperature, pipe size and indicate style below, threaded, flanged or weld ends.

RASMUSSEN MFG. CO.
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HOLLYDALE, CALIFORNIA

DEAN BROTHERS PUMPING MACHINERY INDIANAPOLIS INDIANA

PUMPS

CENTRIFUGAL RECIPROCATING

BUILDERS OF OUTSTANDING PUMPS

Since 1869

4085

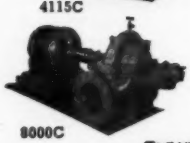
3918

4057A

2446

4115C

2352L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3833

ESTABLISHED 1869

DEAN BROTHERS PUMPS INC.

INDIANAPOLIS IND.

323 W. TENTH ST.

EQUIPMENT MEN . . . in the News

R. A. Fox Named to Manage Graver Construction Co.

R. A. FOX

R. A. Fox has been appointed manager of Graver Construction Co. both for all American projects and for all the company's overseas operations.

Graver Construction Co.'s offices in New York, Chicago, and Houston are under the direction of Fox. His duties also include the supervision of an engineering division in Jersey City, N. J. Announcement of this appointment was made by E. N. Gosselin, president of the parent firm, Graver Tank & Manufacturing Co., Inc.

Fox, who formerly served as field assistant to E. B. Heyden, recently deceased head of Graver Construction, received his mechanical engineering training in Kansas and Texas, and he has had special study in thermodynamics, pneumatics, and hydraulics.

First employed as engineer for Winkler Koch Engineering Co. and then by Sinclair Refining Co. as a designer in Houston, he has held positions of increasing responsibility with petroleum and engineering companies. He has been in charge of planning, construction, and operation of several refineries. He was chief engineer for plant enlargement at Derby Oil Co. in Wichita and later construction engineer for new work at Shell Oil Co.'s Wood River refinery.

Lone Star Building New Plant Near Sweetwater

Construction has started on the new plant of Lone Star Cement Corp. near Sweetwater, Nolan County, in the heart of the rapidly developing West Texas area. The plant is situated near Maryneal on the Santa Fe lines. With an annual productive capacity of between 5 and 6 million sacks of Lone Star cements, this new mill, the third Lone Star plant in Texas, will be one of the most modern in the world.

With materials and machinery already on order, construction schedules call for completion some time during 1951. All of the work will be done by Walsh Construction Co. and Gifford-Hill & Co., Inc., who are associated as general contractors.

Adjacent to the mill where the limestone quarries are located, a large crushing plant will be constructed.

The mill building will house five large ball and tube mills, two driven by 500-hp. motors and the others by 800-hp. motors. There will be two kilns 10 ft. in diameter by 340 ft. long. Natural gas will be supplied by Lone Star Gas Co. Each of these kilns will produce about 2,000 bbl. of clinker every 24 hours.

F. M. Carlisle to Sell Crete-o-Lite, Circ-u-Lite

F. M. CARLISLE

F. M. (Mack) Carlisle, announced recently the formation of a new firm bearing his name: F. M. Carlisle & Associates. The new company distributes two oilfield products: Crete-o-Lite, a light-weight aggregate for oil-field cementing work, and Circ-u-Lite, a lost-circulation additive. Both products are manufactured by Paramount Perlite Co. of Paramount, Calif.

Carlisle, formerly a petroleum engineer with International Cementers and Tide Water Associated Oil Co., stated that these two products were available to operators in oil fields throughout the world. Materials for use overseas are made available through the organization's home office in Whittier, Calif.

Phillips Offers Glassware Specialties

Phillips Petroleum Co. has announced that its modern glass-blowing laboratory, located in Bartlesville, Okla., is now offering a complete service for the fabrication, modification, or repair of those glassware items of unusual or intricate design which are not otherwise readily available. R. J. Brunfeldt is in charge of this specialized operation.

The laboratory is equipped, to manufacture such glass structures as vacuum tubes, pumps, columns, stills, condensers, and microdistillation apparatus. The facilities include a glass-blowing lathe, an annealing furnace, and silvering equipment. Sales will be handled by W. C. Lacy, manager of the instrument sales section of Chemical Products Division.

Lawlor Goes to Tulsa for Pittsburgh Coke & Chemical

E. W. LAWLOR

E. W. (Red) Lawlor, sales-service representative of Pittsburgh Coke & Chemical Co., has been transferred from the Pittsburgh home office to the Tulsa office of the company's Protective Coatings Division. In his new location, Lawlor will assist Frank McNulty, Tulsa manager, in serving the corrosion-protection needs of the Central West.

Lawlor has been associated with the coal-tar-products industry almost exclusively since his graduation from Pratt Institute in 1941. His experience with protective coatings and corrosion protection includes supervision of production, and technical field service and sales.

New Bucyrus-Erie Sales Representative Named

T. R. McELHATTEN

The appointment of T. R. McElhatten as a sales representative for spudders in the eastern oil fields has been announced by Bucyrus-Erie Co.

He will be attached to the Evansville sales district under the direction of C. Earle Stewart, district representative, well drill sales.

To his new position, McElhatten brings an excellent background of experience in the Mid-Continent and eastern oil fields. From 1927 he was associated with Oil Well Supply Co. More recently, from 1937 to 1949, he was connected with National Supply Co.

Weston Appoints Healey As New York District Manager

Earl R. Mellen, president of Weston Electrical Instrument Corp., Newark, N. J., has announced the appointment of William J. Healey as manager of the company's New York district office.

Healey joined the New York sales staff of Weston in 1929, and earlier this year was made assistant mana-

ger of the New York district. Prior to his association with Weston, Healey, a graduate electrical engineer, served as instrument design engineer and specialist with several large manufacturers.

Thompson-Hayward Expands Kansas City Facilities

Thompson-Hayward Chemical Co., Kansas City, Mo., has started construction on two new buildings having a total area of 33,000 sq. ft. in Kansas City. The new buildings will be used to provide both production and storage facilities to serve the Mid-Western market. The new Kansas City facilities, plus substantial additions now being made to existing plant equipment at Kansas City, will more than triple Thompson-Hayward's productive capacity.

Charles T. Thompson, president of the Thompson-Hayward, states that it is the company's intention aggressively to expand both its production and warehousing facilities.

MacClatchie, Grant Name Donnally Vice President

Chester Donnally, former supervisor of Texas operations for Western Geophysical Co. of America, has been appointed vice president of Grant Oil Tool and MacClatchie Manufacturing Cos. in charge of Mid-Continent sales and service, with headquarters at Dallas.

Donnally graduated from Southern Methodist University with a B.S. in geology, and in 1930 was employed by Geophysical Service, Inc., in the Dallas area. Four years later he transferred to Western Geophysical Co., and after some time as party chief in the San Joaquin Valley territory of California, was returned to Dallas as supervisor of Texas operations.

Donham Organization Named As Globe Branch Office

The new Globe Oil Tools sales organization now serving Snyder, Odessa, and other areas of West Texas. Pictured with his service men in front of the Odessa warehouse is H. D. (Spec) Bonham. To his left are D. W. Goodyear, T. E. Fletcher, and W. L. McHugh. Globe roci. bits and junk catchers are carried in stock in all regular sizes at both Odessa and Snyder.

C. O. Relephord Appointed Los Angeles Branch Manager

C. O. RELEPHORD

C. O. Relephord has been appointed to the position of Los Angeles branch manager for the Pump Division, Byron Jackson Co., according to Lynn Sawyer, general manager of the division and vice president of the company. The Los Angeles territory will cover several western states, Mexico, and the Far East.

Relephord was graduated from University of Oklahoma in 1932, with a B.S. degree in petroleum engineering, refinery option. After graduation, he was employed in a sales-engineering capacity, dealing with technical equipment and applications for the oil industry throughout the Mid-Continent area.

Relephord became affiliated with Byron Jackson Co. in 1946, locating in the Houston office of the company, where he has been active in the analysis of the technical applications of pumps for the oil industry.

Worthington-Gamon Elects Four New Officers

Hobart C. Ramsey, president of Worthington Pump & Machinery Corp., has announced the election of the following new officers of its subsidiary, Worthington - Gamon Meter Co., which manufactures liquid meters at its Newark, N. J., plant: Charles E. Wilson, formerly president, chairman of the board of directors; Robert R. Anderson, president; William C. Flanders, vice president in charge of sales; and Walter H. Zeis, secretary-treasurer.

Wilson has served as president of Worthington-Gamon Meter Co. since 1946. In addition to his duties as chairman of the board of the subsidiary, Wilson continues as a vice president of the parent company where he directs the sales activities of the vertical turbine pump and construction equipment divisions.

Anderson, newly elected president of Worthington-Gamon Meter, joined that organization in 1922. In 1932 he was elected treasurer, and in 1942, vice president.

Flanders joined Gamon Meter in 1925 as sales representative in New Jersey and was appointed sales manager in 1937.

Zeis started his career with Worthington in 1925 and served in various accounting capacities until his election as treasurer of the subsidiary company in 1948.

(Continued on page 144)

Oil Capitol Supply Moves to New Building

Oil Capitol Supply Co., Tulsa, has just moved to this new office-warehouse building, expanding its warehouse floor space three times. Started only 18 months ago by Tom N. Word, his brother, S. N. Word, and W. W. (Comp) Compton, the company has extended its operations to cover the entire Mid-Continent area with an extensive stock of general refinery supplies. Main lines handled are Globe Steel Tubes Co.'s welding fittings and tubular goods, and Hancock flow control and gate valves.

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 12c a word one issue. 10% Discount three or more issues. $3.00 minimum charge. Blind Box in our care counts nine words. Payable in Advance.

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
10% Discount three or more issues.

EQUIPMENT FOR SALE

USED ROTARY AND CABLE TOOL DRILLING TOOLS, WIRE LINES, E. A. KELLY, BOX 861, OKLAHOMA CITY. PHONE 5-8407.

WELL equipment. New and used spudders, rotaries, core drills, all sizes and types. Cable tools, drill pipe, bits, pipe. Fishing tools rented. Everything for well service. Pressey & Son, Pueblo, Colo.

TWO Gardner-Denver Compressor Units size 12 x 11 and 4¾ x 11, direct connected with 100 HP electric RPM motor, complete with all equipment; located at Refugio, Texas; in service forty-five days. Will take reasonable discount. Clymore Petroleum Corporation, 238 Kaffie Building, Corpus Christi, Texas.

FOR SALE: 3 complete strings of cable tools, together with 3 Buda drilling engines. Much new material, including bits, drilling lines, etc. Tools located at Russell, Kansas. Harry Gore, 400 Brown Bldg., Wichita, Kansas.

6,000′ OF USED 8⅝″ O.D. 22#, machine cleaned, beveled and welded in 40′ lengths ready to go, priced $1.35 per ft. located East Texas, apply A. A. Gilbert Pipe & Supply Co., Shreveport, La. Ld. 97, P.O. Box 986.

WILSON Mogul Draw Works Unit with compound powered by International UD-18 Motor complete with 55-foot double telescoping mast ready to use. Two Traveling Blocks and Hooks, Rotary, 4-foot Substructure. All in good condition. Real Bargain at only $6000.00. Contact D. C. Bonnet Trucking Co., New Iberia, La.

PIPE LINE EQUIPMENT for sale: Swing Crane, Trackson Model CT-9, practically new, fits International TD-9. $1000.00. Woodard Truck & Tractor Co., Brady, Texas.

GENERATORS for diesel driven electric power, 156 KVA, 240/480 volt, 3 phase, 60 cycle, 900 RPM, complete with exciters and control cabinets, connections for parallel operation of two or more generators, brand new, manufactured by Electric Machinery Manufacturing Company, $2000.00 each, seven available, Northern Ordnance Incorporated, Minneapolis, Minnesota.

FOR SALE: Practically new 24-L Bucyrus-Erie oil well spudder, powered with model 306 Buda Motor, complete with tools, lines, and steel doghouse. Perrine and Perrine, Box 87, Salem, Illinois. Telephone No. 1064.

NEW COUPLINGS

1600 2″ 10 R.T. non-upset tubing
50 5½″ 10 V thread casing
96 7″ 10 V thread casing
2 7″ 8 R.T. casing
79 6⅝″ 10 V thread casing

Used Couplings

762 2″ 10 R.T. non-upset tubing

Rock Island Oil & Refining Co., Inc.
321 West Douglas, Wichita, Kansas
Telephone 5-5674

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO
Box 107, Red Fork Station, Tulsa, Oklahoma

1—4′0″ ID x 40′-6″ x 1¼″ thick tower; 1—7′-0″ ID x 57′ x ½″ thick tower, 19 CI bubble trays; 1—7′-6″ ID x ½″ thick tower, 25 CI bubble trays; 1—2′-6″ dia. x 40′-3 compartment tower, 15 bubble trays. Tri-State Supply Company, Box 610, Mt. Pleasant, Texas.

NATIONAL "50" Compound Double Drum Rig 126′ Cantilever L. C. Moore Mast. 10′ substructure. 6,000′ 4½″ drill pipe. This rig complete and in excellent condition. P. O. Box 205, Sta. B, Bakersfield, California.

FOR SALE: Model S Cardwell Drawworks Powered with WAK Waukesha 5 Speed Transmission 10 Speeds Forward, Good Condition. Longhorn Supply Company, Box 4149, Houston, Texas.

FOR SALE: 37, 6″ and 2, 8″ #1700-F Walworth Lubricated Plug Valves, condition new. Bargain price. Box D-757, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 300 Amp Westinghouse welding machine powered by 6-BK Waukesha engine. Completely overhauled. Less than 50% of new price. Melton Supply Company Box 1360, Seminole, Oklahoma.

FOR SALE: Sullivan Drilling Rig Model 200 RT on truck complete with 2500 feet practically new drill pipe, good condition. $27,500. James F. Gray, 15th Floor Praetorian Bldg., Dallas 1, Texas.

FOR SALE: Approx. 10,000 ft. 4½″ OD Heavy Tubing, ⅜″ to 9/16″ Wall, random lengths 12 to 18 Ft. Also, 5″ OD Heavy Tubing, ½″ Wall. Both good used condition. M. Kaplan & Son, P. O. Box 1883, Phone 5112, Monroe, La.

FOR SALE: Westcott, Foxboro and Emco Gas Meters, Geo. R. Milner. Box 124, Okmulgee, Oklahoma.

FOR SALE

9—230 H.P. Bessemer Type 10 Engines with compressors, Steel Buildings, Valves, and Fittings complete for installation. Located Salem, Illinois Oilfield.

ENGLE PETROLEUM, INCORPORATED
Box 655, Evansville, Indiana
Telephone 5-5179

EQUIPMENT FOR SALE

DRILLING rig located at Greggton, Texas, yard, and consisting of complete steam rotary drilling rig without drill pipe, including 2 120 H.P. oil well boilers, 1 6″ Union Tool unitized draw works, 1 12x12 Ajax roller bearing steam engine, 1 14½x7½x18 Ideal mud pump, Ideal rotary table, swivel, crown block, traveling block, etc. Contact Rudco Oil & Gas Company, Box 2018, Tyler, Texas.

CASING: Good used Lapweld, 5½″ 13 lb.—$1.45; 7″ O.D. 17 lb., No. 1 grade—$1.50; 2,000 ft. 8⅝″ 24 lb.—$1.90; Good 10¾″ 32 lb.—$2.75; Special 10,000 ft. 2″ lapweld tubing, 11½-V threads—35c. Cable drilling and fishing tools for sale or rent. We buy surplus cable drilling tools. Phone 7-5121, H. P. McGinnis, Tri-State Tool and Supply Co., Parkersburg, West Virginia.

BOILERS FOR SALE: 18 Code Oil Field Boilers, 50 to 87 H.P., 100 to 200 Lbs. W.P., Operated Under Hartford into 1948, Not Fired Since. Located on Leases Vicinity Pampa, Texas. Offered Subject to Prior Sale. $500.00 to $700 each, as is, where is. Contact Max Harbison, Kewanee Oil Company, Pampa, Texas.

Welded Stock Tanks

(Save 20%)

100 Barrel to 300 Barrel inclusive, manufactured to A.P.I. Specs., available immediate delivery.

MID-STATES TANK MFG. CO.
Tulsa, Okla.
Day Ph. 2-9128 Nite Ph. 4-1893

RECONDITIONED SEAMLESS TUBING

1 ¼″ OD—150,000 feet
1½″ OD—100,000 feet
2″ OD—100,000 feet
2¼″ OD— 55,000 feet
3¼″ OD— 65,000 feet

Approximately 9 and 10 gauge wall
Single Random Lengths
Plain ends—beveled for welding
Write—Wire—Phone

Sonken-Galamba Corp.
2nd and Riverview (X-654)
THatcher 9243 Kansas City 18, Kansas

PIPE FOR SALE

Approx. 25,000′ of 8″ OD, DRL, used LW line pipe.

Approx. 10,000′ of 4½″ OD, R-2, used seamless pipe, new 8 rd. thrds. and new regular casing couplings.

Approx. 5,500′ of 5 9/16″ OD, R-2, used seamless pipe, new 8 rd. thrds. and new regular 5½″ casing couplings.

Approx. 6,500′ of 7″ OD, 28#, R-2, used seamless casing, new 8 rd. thrds. and new regular casing couplings.

Approx. 1,600′ of 24″ OD, non tested seamless pipe.

BROWN PIPE & MACHINERY CO.
P.O. Box 2368, Phone 3-9391, Corpus Christi, Texas

EQUIPMENT FOR SALE

AVAILABLE for sale and immediate shipment #1 T & C 2" line pipe, seamless and lapweld casing, tanks. Call or write Edco Pipe & Supply Company, Box 565, Drumright, Oklahoma.

FOR SALE: One 350 KW, 480 volts, 3 phase, 60 cycle; and one 400 KW, ditto, Superior natural gas engine generating units, complete with generating panels. Max E. Landry, Inc., 436 Mayo Building, Tulsa, Oklahoma. Phone 5-5639.

3—160 CUBIC FOOT Air Compressors. Diesel: Gasoline. J. C. Morrison, Midwestern Drillers, Liberal, Kansas. Phone 2441.

PIPE—PIPE—PIPE
I have a limited amount of 4½ O.D. line pipe for sale. A. R. Daniel, Garnett, Kansas.

DAVEY Air Compressor, 30 KW Alternating Generator, 2 2 KW Generators, M & S quart canning machine, Lincoln welder, concrete mixer, pumps and other surplus equipment. Oklahoma Refining Company, Seminole.

TWO complete Oilwell Cementing Units on Reo and International Trucks. Each equipped with a 5 x 10 high-pressure Gaso pump 1550C, power driven from the truck motor, and a CH & E Triplex Pump XAH Waukesha with Twin Disc reduction drive. Will sell one or both. Write Floyd Kelly, Box 482, Ingleside, Texas.

FOR SALE: 2 Fairbanks-Morse gas engines No. 208-108, excellent running condition. Mid-Illinois Petroleum Co., 1104 Fayette Ave., Springfield, Ill.

6,218 FEET 7" O.D. 17# new seamless casing H-40 Rg 2 @ 2.90 ft. Phone 5-8850, Tulsa.

CASING—5½ and 7" No. 1 grade, lapweld and seamless.
TUBING—2", 2½", and 3" regular and upset.
WATER WELL CASING—5⅝" and 6¼" Attractively priced.

D. A. MORITZ CO.
9th & B&O, Braddock, Pa.

Several Army Surplus 4½" x 6" Gaso Duplex 1860 Pumps — two piece skid mounted with Chrysler 8 cylinder engines. Will sell pumps only or complete units about half price.

H. H. COFFIELD
ATTN.: W. H. Orr
Phones: 132—Rockdale, Texas
A-86064—Houston, Texas

EQUIPMENT WANTED

RECORDING GAUGES WANTED
State pressure and if daily or longer. R. L. Pattinson, Aylmer, Ontario, Canada.

HELP WANTED

ENGINEERS, EXECUTIVES, TECHNICAL MEN, SALARIED POSITIONS—$3600 TO $30,000. THIS CONFIDENTIAL SERVICE FOR OUTSTANDING MEN WHO DESIRE A CHANGE OF CONNECTION, WILL DEVELOP AND CONDUCT PRELIMINARY NEGOTIATIONS WITHOUT RISK TO PRESENT POSITION. SEND NAME AND ADDRESS FOR DETAILS. TOMSETT ASSOCIATES, 1204 BERGER BLDG., PITTSBURGH 19, PA.

DRILLER ON new Bucyrus and Star spudder. Work near Great Lakes Area. Big hole experience necessary. Box D-777, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN and Domestic Oil Employment Directory covering the oil industry, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla.

ENGINEER WANTED

Major company located in central Ohio desires graduate mechanical Engineer with several years experience in Spudder design. Give age, educational background and complete details of experience. Our employes know of this ad. Reply to Box D-773, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL EXPLORATION

Party Chiefs **Surveyors**

Permanent field jobs on seismograph crews. Must be experienced in all phases of this work. Permanent jobs at good salary.

THE GEOTECHNICAL CORP.
3712 Haggar Dr. **Dallas 9, Texas**

OFFICE MANAGER—CHIEF ACCOUNTANT

Excellent opportunity for man experienced and qualified in oil accounting with well-established, integrated Oil Company. Send photo with data sheet.

Box D-767, The Oil and Gas Journal
Tulsa, Oklahoma

HELP WANTED

POSITION Available February 1, 1951, Assistant or Associate Professor with Masters degree or higher in Petroleum Engineering to teach reservoir engineering courses in rapidly growing school with excellent laboratory and other facilities. Qualifications will determine salary, but will be comparable to industry. Location Southwest. Box D-765, The Oil and Gas Journal, Tulsa, Oklahoma.

CRUDE Oil Treating Engineer, minimum 2 years' experience, college graduate preferred. Headquarters Oklahoma City, territory covers 10 states. Salary commensurate with experience. State education, background, experience, etc. Reply Sohio Petroleum Co., Industrial Relations, Skirvin Tower, Oklahoma City, Oklahoma.

WANTED: Chemical Engineers for process development and process design on petroleum refining and chemical processes. Prefer individuals with several years' experience in one or both of above fields. Southwest location. Write F. J. Heller, Research and Development Department, Phillips Petroleum Co., Bartlesville, Oklahoma.

ELECTRICAL ENGINEER: New large oil pipeline company requires electrical engineer to handle design, construction and devise maintenance procedures, all classes equipment to 5-KV switch gear. Some familiarity with sub-stations to 110-KV, 5000-KVA desirable but not required. No communications or electronics involved. Include full professional and personal details and minimum salary, first letter. Job is permanent. Box D-761, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED
CHEMICAL ENGINEERS

An American Oil Company operating in Latin America requires for its regular staff experienced Chemical Engineers. Must have degree in Chemical Engineering and several years experience in oil refinery process design. Will be required to make engineering studies and prepare process specifications for modifications or additions to oil refinery process equipment to increase capacity, improve product yield, or quality, or reduce manufacturing costs.

Write giving age, education, marital status, and experience resume. Your communications will be held in strict confidence.

Box 308-C
Radio City Station
New York 19, New York

EQUIPMENT FOR SALE

LINE PIPE FOR SALE

100,000′ 2⅜" OD 3.75# & 4# Good Used Lapweld T&C Range 1 Line Pipe
10,000′ 2½" OD x .125" Wall 3.1# New Seamless Steel Tubing, P.E., 16′ to 26′ Lengths
65,000′ 4" OD x .130" Wall Seamless, 5.4#, used as sweet gas line, taken up in 30′ Lengths. Above ground and available for immediate inspection and delivery, FOB Mobeetie, Texas
50,000′ 6⅝" OD 18.97# Excellent Grade Used Lapweld, Machine Cleaned, Torch Beveled Ends 30°, 20′ RML.
5,000′ 6⅝" OD 18.97# Strictly No. 1, Just Like New, Seamless, 45′ Lengths, Plain Ends
5,000′ 6⅝" OD x .183" Wall 12.89# New Spiral Weld, 50′ lengths, Beveled Ends, FOB Kansas
15,000′ 10¾" OD 34# Good Used Lapweld, P.E., 20′ Lengths.
8,000′ 18" OD x .312" Wall 59.03# New Electric Weld, 40′ Lengths
4,000′ 20" OD x .312" Wall 65.70# New Electric Weld, 40′ Lengths

CASING & TUBING

25,000′ 2⅜" OD 4# Good Used Lapweld Range 1 Tubing with New 10 Round Threads and Collars
7,000′ 7" OD 20# Good Used Lapweld Range 1 T&C Casing 10 V-Thd.
5,000′ 8⅝" OD 25# Good Reconditioned Casing, 8 V-Thd., T&C, Range 1
5,000′ 10¾" OD 35.75# Good Used Lapweld T&C Casing, Range 1, T&C, 8 Thread

OTHER SIZES OF LINE PIPE, SEAMLESS TUBING IN SUITABLE SUBSTITUTE SIZES FOR STANDARD PIPE (EXCELLENT FOR GAS, GATHERING AND FLOW LINES), CASING AND TUBING AVAILABLE FOR IMMEDIATE DELIVERY.
FOR FURTHER INFORMATION, WIRE OR PHONE AT ONCE

A. J. STRUBEL

SIDney 1791 . . . 4946 Murdoch, St. Louis, Mo.

STRUCTURAL DESIGNER WANTED

C.E. graduate major in structural design with 3 to 5 years experience in design of steel and reinforced concrete structures and in general drafting room procedure. Experience in structural design in oil refinery or chemical industry desired. Location Chicago.

BOX D-774
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

HELP WANTED

FOR IMMEDIATE employment. Trained experienced Observers, Surveyors and computers. For seismic exploration crews. Age limit 42 years. Domestic and foreign work. Submit experience record in first letter. All replies confidential. Box D-730, The Oil and Gas Journal, Tulsa, Okla.

CHEMIST OR CHEMICAL ENGINEER

For interesting Light Products Research & Development Section Rocky Mountain Refinery. Young college graduate preferred. Send photo with data sheet.

Box D-764, The Oil and Gas Journal, Tulsa, Oklahoma

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Box D-770

The Oil and Gas Journal

Tulsa, Oklahoma

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Major oil company operating in the Middle East requires graduate engineers in the following classifications:

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GEOLOGIST (SEISMOGRAPH)

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ASST. CHEMICAL ENGINEERS

ASST. CHEMIST (ANALYTICAL)

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Also we have positions for experienced and inexperienced civil, mechanical, electrical, construction and highway engineers.

If interested, write giving full outline of personal and employment history.

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The Oil and Gas Journal
Tulsa, Oklahoma

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Graduate Engineers

GOOD OPPORTUNITIES

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INSTRUMENTATION ENGINEERS: Five or more years of progressively difficult experience in Instrument Research Development or Design. Must have broad and thorough knowledge of instrument theory and application. Should have some knowledge of Chemical Equipment and its operation. Must be graduate.

POWER ENGINEERS: Must have five to fifteen years' experience in some of the following: operating, testing and maintaining power plant equipment, supervising power plant operations, making cost and evaluation studies, heat balance work, power cost accounting, design and layout of power plants, and the selection and installation of power equipment. Must be graduate.

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MAINTENANCE ENGINEERS: Five to ten years in planning maintenance work, establishing manpower and material requirements, scheduling and controlling work. Must be thoroughly familiar with Machine and Hand Tools used in Plant Maintenance Work. Must have supervised persons doing maintenance work. Must be graduate. For consultation work.

Give experience, education, age, references, personal history, salary received and salary expected. Please be complete and specific.

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PRODUCTION MAN WANTED

If you want to make a change, we can pay good salary. Man can also buy leases and royalties. Production is approx. 6000 ft. North Texas. Age 40-50. All applications and information held confidential. Write Box 1824, Oklahoma City, Okla.

EXECUTIVE Assistant—Petroleum Engineering education with responsible production experience and administrative ability—Age 32 to 40. Replies confidential. Location Shreveport. Box D-760, The Oil and Gas Journal, Tulsa, Oklahoma.

PIPE Line Experienced? If trained for definite work and under 40 write Employment Dept., P. O. Box 2239, Kansas City, Missouri.

CORROSION JUNIOR ENGINEER Needed immediately. Write Employment Dept., Box 2239, Kansas City, Missouri.

HAVE opening for superintendent small gasoline plant. State experience in letter. Box D-772, The Oil and Gas Journal, Tulsa, Oklahoma.

A LARGE Refinery in the middle West wants Chemists, Chemical Engineers and Mechanical Engineers. State full qualifications in first letter. Write Box D-762, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGER-OPERATOR for natural gas system. Excellent opportunity for young engineer with gas experience. State age, experience, salary expected and when available. Write P.O. Box 155, Quitman, Miss.

SITUATIONS WANTED

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 131, Ph. No. 131, Hobbs, New Mexico.

DRILLING Contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box D-644, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES ENGINEER successfully selling oil field machinery in West Texas desires change. Married, 28, and graduate of U. S. Naval Academy. Prefer sales or job with drilling contractor. Box D-758, The Oil and Gas Journal, Tulsa, Oklahoma.

QUALIFIED Purchasing Agent, warehouse operations, also accounting and public relations experience. Desire change, married, age 42. Box D-759, The Oil and Gas Journal, Tulsa, Oklahoma.

REGISTERED MECHANICAL ENGINEER desires to invest in and assume engineering position with pressure vessel and/or tank fabricator for Tulsa area. Box D-739 The Oil and Gas Journal, Tulsa, Oklahoma

PUMPER understands production treating oil and upkeep of equipment, available. Box D, Carney, Okla.

TOOL PUSHER: Available immediately, 12 years experience large and medium sized rotarys. Worked in ten states, can furnish good references. Box D-763, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING INDUSTRY Specialist desires position as branch manager, representative, or heavy administrative responsibility. Thoroughly trained and experienced. Age 36. Box D-776, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED LANDMAN, age 30, Texas A. & M., seven years with major oil company, desires position with stable oil organization. Location unimportant. Capable all phases of Land Department. Minimum salary $400.00. Reply Box D-775, The Oil and Gas Journal, Tulsa, Oklahoma.

PLANT MANAGER of LUBRICATING GREASE AND OIL PLANT desires connection with progressive oil company. Technical background, extensive experience in plant control and management. Box D-768, The Oil and Gas Journal, Tulsa, Oklahoma.

XUM

SITUATIONS WANTED

LUBRICATING OIL Chemist, Compounder, Technical Adviser. 15 years experience. May I submit my qualifications in detail? Southwest or West. Box 771, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOLOGIST with three years experience in the field (party chief) and three years reviewing field work in Head Office, desires position in Canada. Still under contract, ready to start new employment next January. Write Box D-769, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Pipeline Operator, now employed, desires position with independent company. Beyond draft age. Sober. Single. Thorough knowledge movement crude oil, also production field clerk duties. Excellent references. Will consider foreign assignment. Box D-778, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

HAVE 45 STAR rig complete with tools ready to run, also 7" and 8" and 10" casing; will put use of rig and tools in on drilling deal for working interest in well. Must be good location. Or will sell. Rig located near Rose Hill, Virginia, near Cumberland Gap, Tenn. B. N. Cardwell, 204 North 19th St., Middlesboro, Kentucky.

FOR SALE: One hundred fifty acre oil lease, eight old wells all pumping, twenty good locations to drill, two and one-half miles north Scottsville, Kentucky. Buel Wilson, Scottsville, Kentucky.

OIL AND GAS LEASES, Shelby County, Texas. Holdings in and around active major company blocks. Write for full details. Box D-722, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES

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FOR SALE

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Can supply the new sensationally beautiful synthetic titania gemstone "rainbow diamond," facet cut, showing greater brilliance than the diamond and at a small fraction the cost. Harder than amethyst. Christmas is coming.

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REAL ESTATE

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Prominent oil and gas producer, recently widowed, desires to dispose quickly of his executive type mansion on landscaped 3 acres in choice section of Los Angeles area for less than 20% of replacement value. One of the finest homes in Southern California.

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744 E. Green St., Pasadena 1, California

ROYALTIES

DEEDED ROYALTIES
San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington, New Mexico.

MONTANA ROYALTIES

Millions of acres now leased by world's major companies, with huge drilling play in prospect. For booklet describing Montana geology and oil development, write Landowners Royalty Company, Box 1225 Great Falls, Montana.

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FOR SALE OR CHARTER: 83' TWIN SCREW DIESEL BOAT, IDEAL FOR SURVEY OR CREW. B. O. SCOTT, 5033 FOURTH STREET, PORT ARTHUR, TEXAS.

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell, Registered Patent Attorneys, Suite 418, 815-15th Street, N.W., Washington 5, D. C.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908. Oil-Gas (all states), Business, Real Estate, Legal Forms, Leases, Revised With Government Regulations, Commercial Printing. Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that the W½NE¼ sec. 8, T. 31 S., R. 25 E., M.D.M., California, 80 acres, within the known geologic structure of the Coles Levee field, will be offered in one parcel for oil and gas leasing, through competitive bidding, at 1 p.m., Eastern Standard Time, November 29, 1950, when bids will be opened. Details of the lease offering and how and where to file bids, may be obtained by addressing an inquiry to the Manager of the Land Office, Sacramento, California, or to this office. Marion Clawson, Director.

LEGAL

Notice of Oil and Gas Lease Sale. Sealed bids will be received until 2:00 o'clock, P.M., December 15, 1950, on 400 acres of Allotted Indian land on the Southern Ute Reservation in Twp. 33 N., R. 7 W., N.M.-P.M., Colorado. Information may be secured from the Superintendent, Consolidated Ute Agency, Ignacio, Colorado.

LEGAL

3,978.36 acres of Tribal and 729.17 acres of allotted Indian Lands located in Twp. 12 N Range 22 & 23 E.; Twp. 13 N Ranges 21, 22, & 23 E.; Twp. 14 N Range E. and Twp. 16 N Range 31 E., BHM, in the Cheyenne River Reservation, South Dakota, are being advertised for oil and gas leasing, bids on which will be opened December 5, 1950, at 2:00 P.M., C.S.T. at the office of the Superintendent of the Cheyenne River Indian Agency, Cheyenne Agency, South Dakota. Full descriptions and copies of the advertisement may be obtained from the Superintendent, Cheyenne River Indian Agency, South Dakota, or from the Oil and Gas Supervisor, U. S. Geological Survey, Federal Building, Casper, Wyoming.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that approximately 100 acres comprising the U. S. Naval Hospital Site at Long Beach, California, will be offered for oil and gas leasing, through competitive bidding at 1 p .m., Eastern Standard Time, December 6, 1950, when bids will be opened. Operations on the land must be so conducted as not to interfere with or endanger the use of the land as a hospital site. Details of the lease offering, how and where to file bids, and copy of the form of lease may be obtained by addressing an inquiry to the Oil and Gas Supervisor, at Los Angeles, California, or to this office. Marion Clawson, Director.

EQUIPMENT MEN

(Continued from page 140)

Oilwell Names Moore to Supervise Garland Plant

D. R. MOORE

Fred F. Murray, president of Oil Well Supply Co., has announced the appointment of Dewey R. Moore as superintendent of this United States Steel subsidiary's new warehouse and modification center, Garland, Tex.

Moore has been assistant manager of drilling equipment sales in the general sales department since December 1945. Just prior to joining Oilwell in 1945, he operated his own manufacturing firm, Moore Derrick & Equipment Co. at Perry, Okla.

The Garland warehouse and modification center will back up more than 50 field stores in the Southwest. At ground-breaking ceremonies earlier in the year, Murray pointed out that the location is within 24 hours' shipping time from every major oil field in the Southwest.

Big Four Adds Warehouse In Oklahoma City

Adding to its expanding organization, Big Four Machine & Supply Co. has established a warehouse in Oklahoma City, with Clearman Tool Co. which will represent the pioneer oilfield equipment firm.

Established in Clay City by John R. Riley, Big Four has sales representatives, warehouse stocks, and export connections to serve the oil industry anywhere.

Big Four shops and manufacturing facilities are located at Clay City, Ill., and Pawhuska, Okla. The company also owns and operates Beaver Tool & Machine Co. at Maysville, Okla. Complete stocks are carried by C. & W. Machine Works Co., Great Bend, Kans.; Tillery & Parks, Odessa, Tex.; L & H Machine Co., Houston; Clearman Tool Co., and Beaver Tool & Machine. General offices are in Oklahoma City.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that the NW¼NW¼ sec. 8, T. 9 N., R. 8 W., St. Stephens Meridian, Mississippi, 40 acres, within the known geologic structure of the Eucutta field (undefined), will be offered for oil and gas leasing, through competitive bidding, at 1 p.m. E.S.T., December 6, 1950, when bids will be opened. The details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to this office. Marion Clawson, Director.

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Illinois Fields

(Continued from page 133)

J. H. Gilliam 1 Orman, SW NE SW 7-6s-10e, dry, TD 3,136 ft.

WESTERN KENTUCKY WILDCAT FAILURE

Webster County: Iley B. Browning 1 Durbin, SW NW NW SW 4-L-23, dry, TD 3,304 ft.

INDIANA SUCCESSFUL WILDCAT

Gibson County: J. F. Howard 1 Pauley, SW SW NE 20-1s-10w, IP 110 bbl., McClosky 1,978-89 ft., TD 1,989 ft.

INDIANA WILDCAT FAILURES

Knox County: Frank B. Murta 1 Schuneman, SE NW SW 12-1s-12w, dry, TD 2,415 ft.

Sullivan County: Miami Operators 1 Bays, NE SW NW 8-7n-10w, dry, TD 2,850 ft.

EASTERN KENTUCKY

ASHLAND.—In Big Sandy gas field and on Brushy Fork in Pike County, Kentucky-West Virginia Gas Co. has deepened 675 J. A. Acott from an old total depth of 3,006 ft. to 3,581 ft. Bottomed in Devonian black shale, the test made 311,000 cu. ft. of gas daily after shooting with 5,800 lb. of gelatin.

A location for new wildcat test for Greenup County has been staked. New venture is that of Dixie King Coal Co. 1 Boggs, 3-Y-79, 6 miles due east of Greenup.

Permian Basin

(Continued from page 129)

Sterling County: Weiner & Hayward 1 R. P. Davis, 35-14-SPRR, 1½ mi. W Sterling City, dry, TD 2,005 ft.

Terry County: Ohio Oil Co. 1 A. R. Brownfield "A," 10-T-D&W, 5 mi. SW Mound Lake field, dry, TD 11,029 ft., elev. 3,205 ft., Yates 3,000 ft., San Andres 4,668 ft., Spraberry 7,480 ft., Pennsylvanian 10,300 ft.

Yoakum County: Cabot Carbon Co. 1 J. W. Walser "A," 317-D-J. H. Gibson Sur., 5 mi. NW Cobb field, dry, TD 5,345 ft., elev. 3,640 ft., San Andres 4,580 ft.

SOUTHEAST NEW MEXICO

HOBBS.—Amerada Petroleum Corp. 2 J. T. Caudle, 1-mile northwest outpost to production in the Bagley-Hightower area of northwest Lea County, was drilling ahead at 8,739 ft. following a drill-stem test covering top of the Pennsylvanian, from 8,565-8,717 ft.

The 4-hour and 8-minute test had gas in 4 minutes, and flowed mud and distillate in 8 minutes. Distillate yield over the balance of the test was a little over 41 bbl., which tested 59.7° gravity. Gas flow was 6,850,000 cu. ft. daily, flowing at 1,490-1,575 psi. Shut-in pressure registered 3,050 psi. in 15 minutes. There was some sulfur water in bottom of the tester.

Tide Water Associated Oil Co. 3 State "S," north outpost to the Brunson Ellenburger field in southeastern Lea County, was in the pre-Cambrian at 7,629 ft. Drill-stem test from 7,568-7,615 ft., in the Ellenburger, had gas in 7 minutes and recovered 3,780 ft. of 42°-gravity oil, plus 210 ft. of heavily oil and gas-cut mud. Higher pay was found on two tests, at 7,440-90 and 7,490-7,544 ft.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Eddy County: H. N. Smith 1 A. J. Mayes, 10-26s-24e, dry, TD 600 ft., elev. 3,725 ft., Delaware sand 450 ft.

TEXAS PANHANDLE (DISTRICT 10) WILDCAT FAILURES

Armstrong County: Chas. Parks 1 Cobb, 10-1TWNW, 12 mi. S, 1 mi. E Claude, dry, TD 5,900 ft., elev. 3,388 ft.

Sherman County: Panhandle Eastern 1-46 Blake, 46-3T-T&NO, SE corner of county, dry, TD 6,642 ft., elev. 3,386 ft., Mississippian 6,595 ft.

Louisiana-Arkansas

(Continued from page 132)

Union County, Arkansas, got its first Pettit production at J. L. Foster (El Dorado Drilling Co.) 1 Sally Irby, a dry hole reworked. Located in NE SE 22-18s-17w, the well produced 243 bbl. of 41.6-gravity oil, no water, per day from the lime at 4,002-06 ft. The new area is unofficially called "Trull," and an allowable of 100 bbl. has been set but spacing rules have not been announced. A second well, 2 Irby, has been staked 30 ft. south and east of the discovery.

NORTH LOUISIANA SUCCESSFUL WILDCATS

Catahoula Parish: Pan Am Southern Corp. and Austin Stewart 1 Lucille B. Gillis, SW SW 14-8n-7e, TD 6,512 ft., perf. Wilcox 4,638-39 ft., flowed 98 bbl. of 38.5°-gravity oil per day through 7/64-in. choke, basis 4-hr. test, TP 485 psi., CP 620 psi., GOR 220-1.

Grant Parish: Justiss-Mears Oil Co. 1 Erwin, SE NE 27-6n-2e, TD 5,205 ft., PB 2,430 ft., pumped 28 bbl. 22°-gravity oil per day from open hole at 2,424-30 ft. in Sparta.

NORTH LOUISIANA WILDCAT FAILURES

Bienville Parish: Daley Brown 1 Bertha Brown, 14-15n-10w, dry, TD 3,032 ft., elev. 294 ft.

Bossier Parish: Sam Sklar-Ashland Oil 1 S. H. Bolinger, 6-22n-12w, dry, TD 3,315 ft., elev. 338 ft., Blossom 2,790 ft., Tokio 3,052 ft.

Claiborne Parish: Continental Oil 1 P. C. Wideman, 21-21n-7w, dry, TD 8,734 ft.

Concordia Parish: R. A. Campbell 1 Fairbanks, 11-4n-6e, dry, TD 7,225 ft., elev. 60 ft., Cockfield 2,711 ft., Cook Mountain 3,266 ft., Sparta 3,490 ft., Cane River 4,322 ft., Wilcox 4,613 ft.

Hunt Oil 1 Angelina Hardwood Lumber Co., 18-4n-8e, dry, TD 7,511 ft., elev. 51 ft., Wilcox 4,770 ft., base Big shale 6,064 ft.

Richland Parish: Crescent Producing Co. 1-A C. T. Munholland, 35-17n-9e, dry, TD 3,884 ft., elev. 102 ft., Cook Mountain 897 ft., Sparta 806 ft., Wilcox 1,868 ft., Midway 2,985 ft., Tuscaloosa 3,564 ft., Paluxy 3,810 ft.

ARKANSAS WILDCAT FAILURES

Hempstead County: J. R. Black 1 Carraway, 21-12s-25w, dry, TD 3,175 ft.

Ouachita County: G. K. Burton 1 Fred Wood, 33-11s-19w, dry, TD 2,511 ft., Midway 330 ft., Arkadelphia 790 ft., Nacatoch 845 ft., Tokio 1,470 ft., Buckner 2,220 ft., Smackover 2,395 ft., elev. 234 ft.

CALENDAR OF EVENTS

The Calendar of Events will be found on page 29 of this issue, immediately following the feature "They Say."

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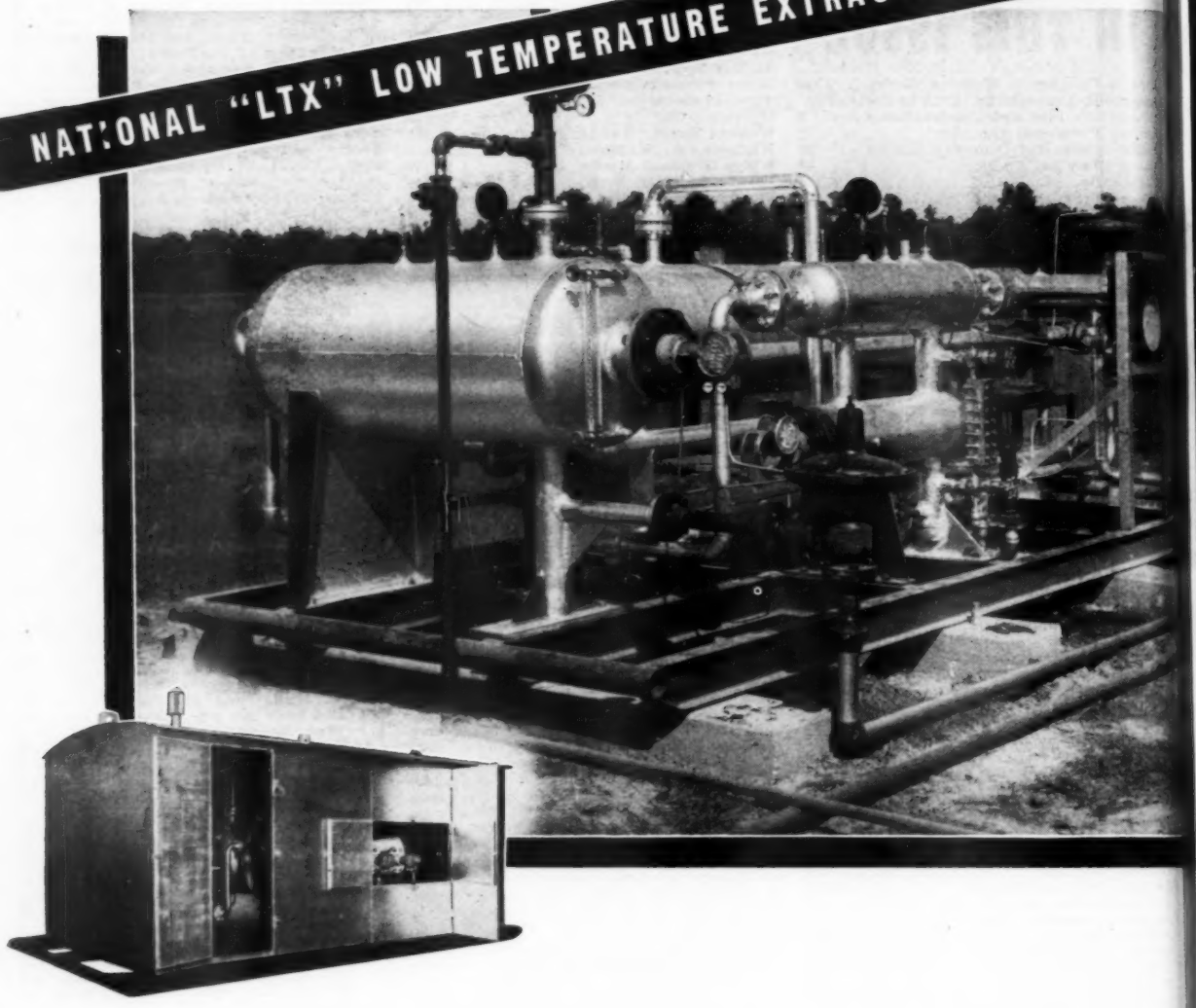
NATIONAL "LTX" LOW TEMPERATURE EXTRACTION UNITS



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